REPORT TO CONGRESS

Impact of the Changes in the ESRD Composite Rate

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REPORT TO CONGRESS ON THE IMPACT OF THE CHANGES IN THE ESRD COMPOSITE RATE

INTRODUCTION

Medicare coverage was extended to persons with end-stage renal disease (ESRD) and became effective on July 1, 1973 as a result of the enactment of Public Law 92-603 (Section 299I), known as the Social Security Amendments of 1972. Since the inception of the ESRD program in 1973, a continuing effort has been made by the Health Care Financing Administration (HCFA) to improve the efficiency and effectiveness of this program.

A program of this nature, designed for persons affected by a particular disease syndrome, had never before been attempted within the scope of the Medicare program. In this instance, persons with kidney failure were entitled to receive specialized therapy within the Medicare program.

The program was designed to meet the medical care needs of several thousand persons who were found to have irreversible and potentially fatal complications resulting from kidney failure. Over the years, technology and methods for treating persons with ESRD have changed markedly. At the end of 1986, there were 99,101 patients participating in the dialysis program, of which 26,654 were newly enrolled during this year. In addition, 7,983 patients had kidney transplants in 1986.[1]

Most of these patients start their treatment regimen by having dialysis in hospital centers. With time and improvement in technology, significantly larger numbers of patients are able to be treated in their homes or successfully undergo kidney transplants.

This latter group is no longer dependent on dialysis as the only treatment modality for survival. In fact, the quality of life of kidney transplant recipients has been observed to be greater than is observed for persons on dialysis.

Unfortunately, the opportunity for kidney transplantation as a viable alternative is not always available to every person with kidney disease. This is the case for several reasons, not the least of which is the general physical health status of potential recipients. There are other problem areas that must be considered in the decisionmaking process for kidney transplantation including the patients' tissue and blood sensitivity and the availability of organs.

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[1] "End Stage Renal Disease Patient Profile Tables for 1986," (Tables 1, 3, and 4), Bureau of Data Management and Strategy, Health Care Financing Administration, October 1987.

ISSUE

In October of 1986, Congress passed the Omnibus Budget Reconciliation Act (Public Law 99-509) which mandated a special study of the $2 reduction in the composite rate for the ESRD program that had occurred in 1986.[2] The specific language related to the conduct of this study was presented in Section 9335(b) of the Act.

The objective of this study is to determine the impact of the composite rate reduction on access and quality of care provided to patients with ESRD who receive dialysis in a variety of settings. Further, the language in the Act required that the Secretary submit a report from this study to Congress by January 1, 1988.

The impetus for this particular study arose from concerns by members of Congress, private citizens, as well as by HCFA. The question to be answered is basically whether the reductions in the rates of payment for facilities and physician services would have any adverse effect on patients who require dialysis.

In August of 1983, HCFA instituted a major reduction in the payment rate for outpatient dialysis. The reduction in the composite rate amounted, on average, to $12 per dialysis session. This earlier rate reduction was significantly greater than the 1986 rate reduction and offered an excellent opportunity to study the impact of a substantial payment reduction upon the provision of services.

Thus, although the impetus for the Congressional study was the reduction in 1986, we have focused on the substantially larger reduction that took place in 1983 for two reasons. First, the amount was much greater and we would be more likely to detect changes in the provision of services in response to payment changes, and second, a reasonable amount of time has passed since the reduction was implemented so that adequate data could be collected on utilization and patient outcomes.

The study period starts from before the institution of the rate reduction (1982), spans 1983, and was extended to 1984 in order to measure any significant impact on morbidity and mortality that might have occurred. In addition, the data on related aspects of dialysis were assembled and analyzed by our grantee from as far back as 1980 and up to 1985.

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[2] Composite rate for dialysis is a payment based on the weighted average audited costs of providing: (a) facility hemodialysis and (b) home dialysis. Under the composite rate, hospital-based and independent ESRD facilities are paid a weighted average of the cost of caring for facility-based and home-based individuals.

MANDATED STUDY

It is important to note that the language within the Act (OBRA '86) requested that the Secretary of Health and Human Services invite the National Academy of Sciences (Institute of Medicine) to conduct this study. In addition, there was provision for the selection of an alternate organization if the National Academy of Sciences declined to do the study, as long as it was considered as an "appropriate nonprofit private entity." After a period of several months, the National Academy of Sciences withdrew from consideration for several reasons.

The primary reason was that they envisioned the conduct of a comprehensive study of the ESRD program. The study mandated by Congress of necessity required a narrow focus and very fast turnaround time. Because of these constraints, the Academy elected to decline as a participant.

As an alternative, a grant (cooperative agreement) was awarded on June 1, 1987 for a proposal submitted by The Urban Institute to conduct the analysis underlying the mandated study. The Urban Institute has extensive experience in this area and has conducted analyses with HCFA's Medicare tape files in the past, including studies with the ESRD computer-based files.

STUDY METHODOLOGY

For purposes of this study, the researchers "treat(ed) the imposition of the composite rate as a kind of 'natural experiment' because it did not affect every unit and every geographic region in a uniform way."[3] HCFA has maintained a substantial data base file on utilization and expenditure data for persons enrolled in the ESRD program. A portion of this file was made available to this awardee for compilation and analysis. Because of the availability of this rich data base, it was possible to carry out both longitudinal (before and after) and cross sectional (slices at specified points in time) studies.

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[3] Held PH, et al., "Effects of the 'composite rate' on ESRD patients, providers, and spending," (Report to HCFA from Cooperative Agreement No. 17-C-99021/3-01 with The Urban Institute, Washington, November 2, 1987).

The objective was to assess the impact of the reduction of the composite payment rate for dialysis services to Medicare beneficiaries with ESRD on--

a. patient access to medical care, particularly dialysis, and characteristics of the care following the institution of the payment reduction (e.g., shorter treatments? fewer sessions? difficulty in getting appointments for dialysis? unexpected referrals or routing to alternate sources for care?), and

b. changes, if any, in the quality of the care that was provided to patients who received dialysis (e.g., increases in mortality? increases in morbidity or required hospital stays? secondary conditions? complications? infections?).

In 1983 several changes were instituted; one had to do with the payment structure (dialysis centers and home dialysis reimbursed at the same rate) and another was simply a reduction in the amount reimbursed. Other changes were made in Part B of Medicare, including the method of payment for physicians providing routine supervision of dialysis.

Prior to August 1, 1983, physicians' dialysis services were reimbursed under one of two methods--the initial method and the alternative method. Under the initial method, physicians received payment for their supervisory dialysis services directly from the facility, usually under a salary or contract arrangement. Under the alternative reimbursement method, physicians were paid a monthly fee for each patient for all outpatient renal care of that patient.

After August 1, 1983, the initial method of reimbursement was eliminated and the alternative reimbursement method was modified to become the monthly capitation payment (MCP) method. The MCP method is similar to the alternative reimbursement method in that it is a comprehensive monthly payment for all renal-related services for each dialysis patient. The major difference is that the same rate is paid for patients who are treated in a facility and for patients who are treated at home. In 1986, there was only one major change in the ESRD program, a reduction in the composite rate of $2 per session.

The task, in this instance, was to measure the impact of the payment reduction on access, utilization patterns, mortality, morbidity, and expenditures. As part of the methodology to accomplish this analytic study, a number of institutional variables were collected and taken into account. The institutional variables thought to be critical in this instance included items such as type of center, ownership, size, and reuse of dialyzers which were used as control variables in the analysis.

Other items were also assembled and used as control variables for the analysis phase of this study. In particular, it was felt that something could be learned from the examination of whether the dialysis was being carried on in States where the prospective payment system (PPS) was in force or whether the care was being provided in the non-PPS States.

It is important to mention that this is a rather complex study to carry out because other factors, such as the institution of PPS, inflation, and price changes in related health services took place during the period under study. The researchers took this into account and were able to utilize a series of statistical methods to control for these intervening events.

The following section summarizes the major findings that have resulted from the analysis. It was not possible to collect information to make any comparisons of the impact of the $2 composite rate reduction in 1986 on the ESRD patients, as not enough time has elapsed to assemble the volume of experience to carry out a statistically valid study.

FINDINGS

Early in December 1987, a report was provided to HCFA by The Urban Institute. It was decided that the best approach to preserve the flavor and depth of the original report would be to submit it as a set of stand-alone attachments to this report. The findings from the analysis are:

Impact on costs--

- o It would appear that some savings in outpatient dialysis and physician services per "patient days at risk" have accrued to Medicare following the imposition of the composite rate for dialysis (see Charts 1 and 2).[4]
- o Payments to physicians experienced the largest reductions in the period 1982-1984 (see Charts 1 and 2).

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[4] Patient days at risk - an analytic method utilized by The Urban Institute to adjust for the fluctuations in the study population denominator by site of service (e.g., inpatient, outpatient).

- Significant dollar increases were observed for total approved inpatient charges per day at risk for patients located in PPS States, which appear to have offset the outpatient savings. These charges represent payments for both dialysis and other required hospital services (see Chart 3).
- Experience in non-PPS States suggests that the composite rate and other policy changes did lead to nominal savings in the total Medicare cost per patient day at risk (see Chart 1).
- There is no clear evidence on how renal facilities were able to control their costs to offset lower Medicare payments.

Impact on access and quality of care--

- Home hemodialysis did not grow faster after the decrease of the composite rate; all growth in home dialysis was due to the increased use of continuous ambulatory peritoneal dialysis (CAPD) (see Chart 4).
- There is some evidence of an increase in the number of dialysis treatments per patient, but not a large enough increase to fully offset the reduction in the price paid for each.
- There were no obvious indications of quality problems on the gross measures commonly used for aggregate analysis---no apparent changes in the patterns of patient survival and morbidity.
- Reuse of dialyzers has continued to rise among all types of units, however it is not clear whether the composite rate changes increased the practice of dialyzer reuse (see Chart 5).
- The number of ESRD patients per staff increased for all types of dialysis units (see Chart 6).
- The number of dialysis facilities has continued to increase suggesting that, in general, access to care was not impeded (see Chart 7).

CONCLUSIONS

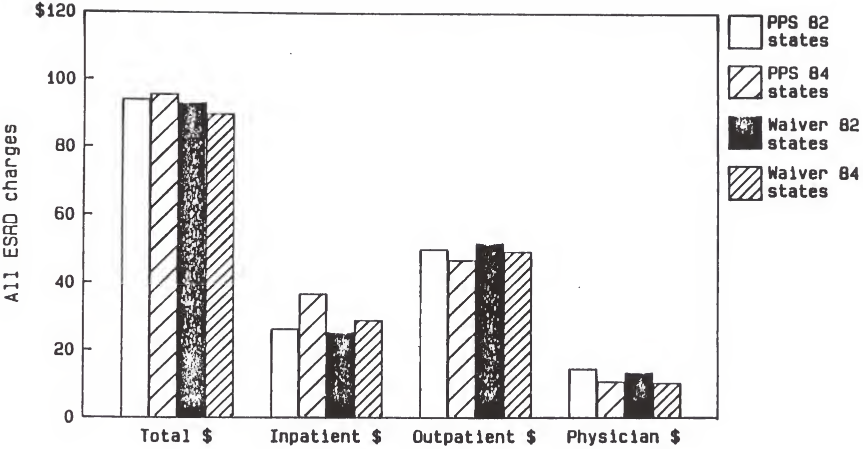
It is obvious, after exploring the findings from the study as reported by The Urban Institute, that there is little evidence to support the notion that the reduction of the composite rate had any negative impact on patients with ESRD during the time period studied.

However, it is important to acknowledge that changes did take place during the time period of the study. They include an increase in the number of dialysis treatments per patient, a rise in the number of centers that reuse dialyzers, an increase in the number of patients per staff member in the dialysis centers, and a small but steady rise in the number of persons receiving dialysis at home. In 1982, 11,733 persons out of 65,765 patients on dialysis received this therapy at home, while in 1985 16,403 of 84,797 persons on dialysis were receiving dialysis at home.

In addition, there was observed to be a decrease in the payments to physicians. It can be stated that there was clearly an overall savings to the Medicare program for all outpatient dialysis services following the institution of the composite rate reduction in 1983.

In conclusion, we found no detectable negative impact on patient access to services, nor on the quality of care provided to ESRD patients following the reduction in the composite rate.

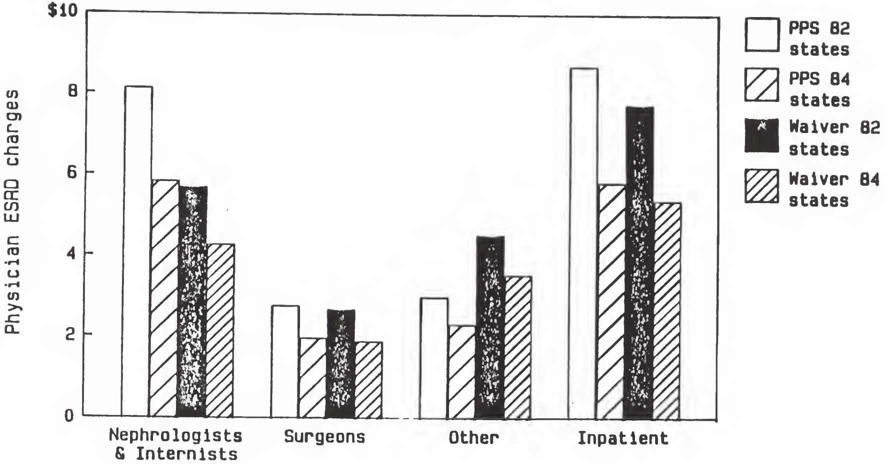
ESRD charges per DAR
1982-1984
ALL - SIMPLE MEANS



Patient days at risk (DAR): 1984

CHART 1

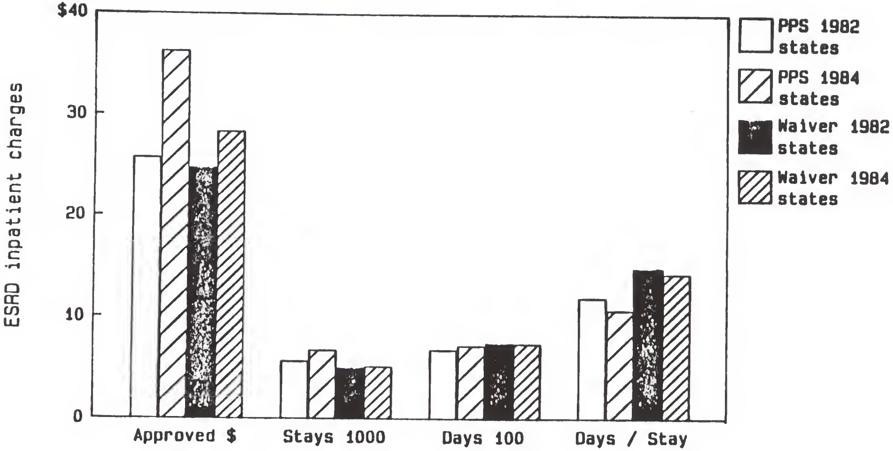
ESRD charges per DAR
1982-1984
PHYSICIAN - SIMPLE MEANS



Patient days at risk (DAR): 1984

CHART 2

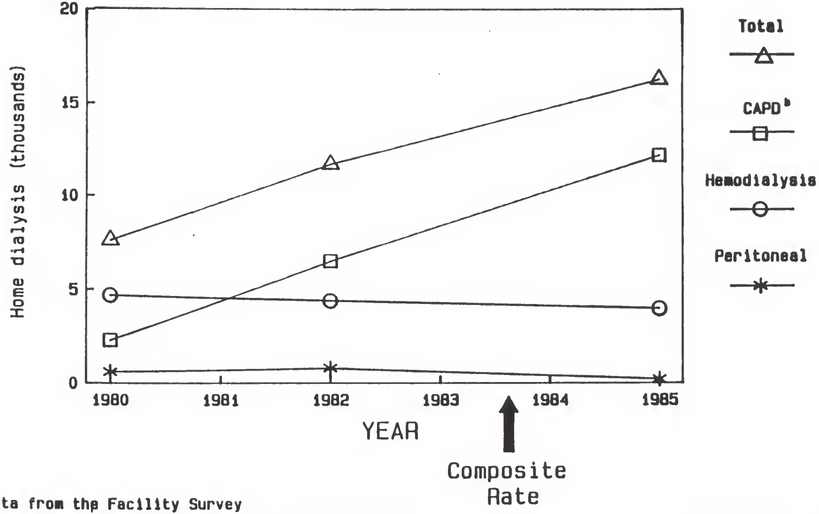
ESRD charges per DAR
1982-1984
INPATIENT - SIMPLE MEANS



Patient days at risk (DAR): 1984

CHART 3

Home dialysis patients, 1980-1985[a]



a. Data from the Facility Survey
b. Continuous ambulatory peritoneal dialysis (CAPD) and continuous cycling peritoneal dialysis

CHART 4

Percentage of units reusing dialyzers by type of unit, 1980-1985

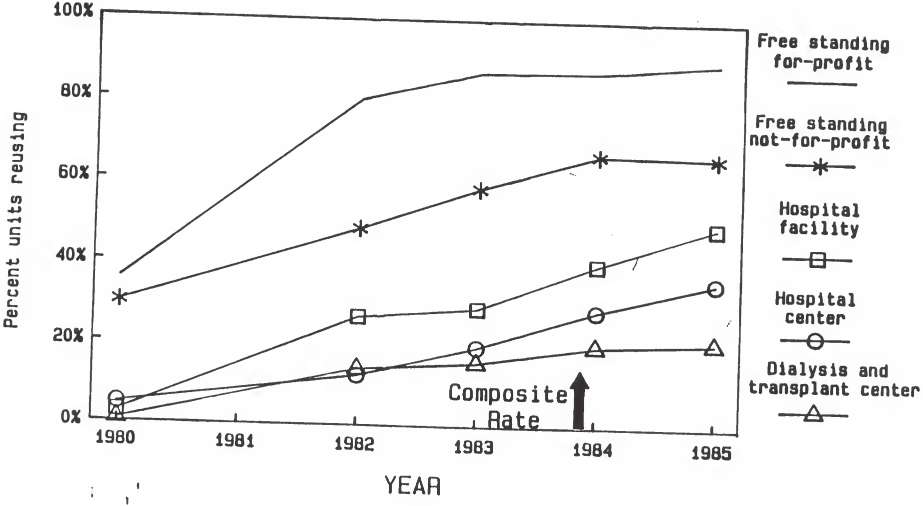
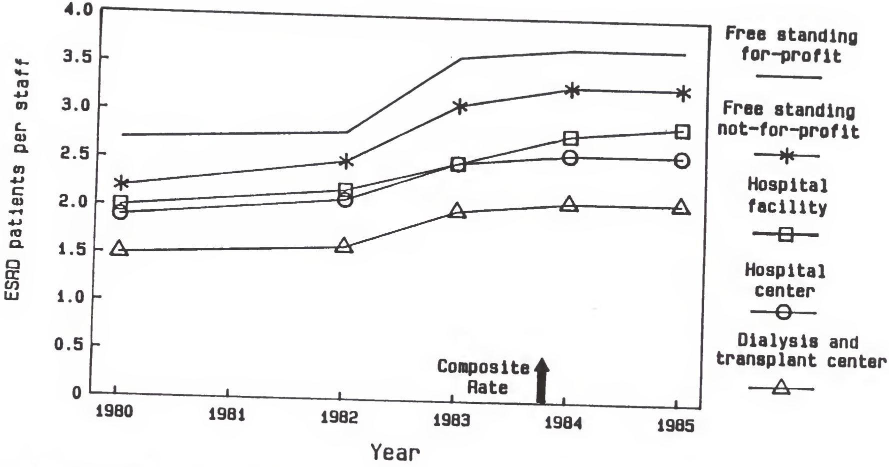


CHART 5

ESRD patients per staff by unit type, 1980–1985



Data from CDC. Estimates based on patients treated / staff employed in last full week of the year.

CHART 6

NUMBER OF RENAL FACILITIES

Milestones	Hospital Based Facilities	Average Monthly Change in Facility Count	Independent Facilities	Average Monthly Change in Facility Count	Total	Average Monthly Change in Facility Count
FR Notice Composite Rate (5/11/83)	623		591		1214	
OBRA 86-$2 Reduction (9/30/86)	649	0.65	845	6.4	1494	7.0
Facility Inventory (11/2/87)	656	0.54	948	7.9	1604	8.5

CHART 7

FINAL

3723-05 DECEMBER 21, 1987

EFFECTS OF THE 1983 "COMPOSITE RATE" CHANGES ON ESRD PATIENTS, PROVIDERS, AND SPENDING

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EXECUTIVE SUMMARY
INTEGRATING THE FINDINGS: WHAT IS KNOWN AND NOT KNOWN

The most salient finding of this assessment to date[1] is that Medicare appears to have saved money following the imposition of the composite rate for kidney dialysis, compared to what it would have otherwise have spent. Table 1 summarizes our results.) Because so many policy changes were implemented at the same time, one can not be definite as to the precise causes of the savings, but the evidence is consistent with a separate composite-rate contribution.

In absolute dollar amounts, the largest reduction occurred in institutional outpatient spending. This partly reflects dialysis's large share of total spending. Changes in utilization did offset somewhat the cut in payment levels,[2] but not enough to totally negate the outpatient reduction. Allowable outpatient (non-physician) charges per ESRD patient day (days at risk) appear to have declined by 5.6 percent between the introduction of composite rate and the end of 1984. (Figure 8A, pg. 60).

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[1] Despite all the information already available, not all possible analyses can be accomplished so early in time. Subsequent updates of the information in this report are planned, to occur primarily through revisions to the appendices; HCFA has funded an ongoing, two-year research grant that will continue analyses through June 1989. Other work is also desirable. It is anticipated that further information will also be included as a matter of course in the next annual ESRD report to the Congress.

[2] There were nominal-dollar increases in inpatient total approved charges per day at risk for patients located in PPS states from 1982 to 1984, presumably reflecting new pressures for treatment under DRGs. Payments for patients located in "waiver" states, ones that did not change hospital payment, saw absolute-dollar declines in the total approved charges with no material changes in the inpatient amounts. In other words, the experience in the waiver states where analytical interpretations were less blurred by the PPS changes, suggest that the composite rate and other policy changes did lead to savings in the total Medicare cost per patient day at risk. See Figure 5 below.

Some shifts among different categories of program spending also occurred, probably as a combined result of the various policy changes. For example, in PPS states outpatient hospital spending increased probably because of the PPS incentives.

How was this apparent drop in Medicare spending accomplished in ESRD care? (Table 1A summarizes.) Was access to care changed? No gross measure of access to dialysis treatment has shown significant changes, although subtle factors remain unmeasured. Indeed, the number of units available to treat patients continues to grow. Nor did significant shifts in the dialysis industry occur to show that patients moved differentially to larger or more efficient units.

How, then, did individual units accommodate to lower payment levels for dialysis? Contrary to expectations, home dialysis did not grow faster after composite rate. All growth in home care seems due to the increase in the relatively new technology of Continuous Ambulatory Peritoneal Dialysis (CAPD). Hemodialysis at home showed almost no change after composite rate. The average size of dialysis units did increase somewhat, so modest economies of scale may have occurred. There is no readily available evidence on whether savings were achieved by lowering units' net revenues or salaries to workers or owners of dialysis units.[3] There is some evidence of an increase in the number of dialysis treatments per patient, but not enough to fully offset the reduction in price paid for each.

Have there been changes in important attributes of dialysis itself, including medical quality? Have units become somehow more efficient or "cut corners" in any way? Evidence is limited, but instructive. No obvious

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[3] Unfortunately, what information HCFA routinely collects on staff salaries at dialysis units is not available in computer-readable form.

Table 1

Overview of Key Issues and Results, 1983 Composite Rate Changes

(Composite Rate = CR)

General Policy Concern	Results/Issue	Finding or Comment
Multiple Policy Changes Occurred Simultaneously (e.g. CR & DRG)	Isolation of CR effects difficult	Both longitudinal and cross-sectional analysis; controlled by PPS vs. "waiver states" (w/o DRG), differential amounts of CR by unit
Access (sect. III.B)	Increases in numbers of units have not slowed	Upward trend may have increased; number of nonoperational units down
	Concentration by unit size has not changed	
	Diabetics have continued to increase	Diabetics have high costs
	Home dialysis has not increased	CAPD has increased, not hemo Transplants have increased (alternative to home dialysis)
Cost (sect. III.C)	Spending on outpatient down by 5.6%	Some offsets to CR in higher utilization
	Dialysis treatments/patients may have increased	
	Inpatient use may be up in PPS states	No change in waiver states Not shown to be linked to CR
	Reuse of dialyzers is up	Not shown to be linked to CR
	Patients per staff up 6%, 1983-1985	Needs verification
	Physician charge data are incomplete	
Quality (sect. III.D)	Morbidity (H. days) may be up in PPS states	Not shown to be linked to CR
	Changes in mortality not shown to be correlated to CR	Needs more analysis to distinguish secular trends from policy shifts
	Changes in patient quality of life not studied	Intangibles are numerous in dialysis, other medical care

Table 1A

Reconciling Results in Cost, Access and Quality, 1983 Composite Rate Changes

Issue	Resolution/Hypothesis/ Additional Analysis
Changes in Medicare spending are clearest findings.	Dialysis payment levels are down, but there were some offsetting rises.
Effects on dialysis and other spending are different? Why?	Not surprisingly, dynamics of incentives shifted, so offsets and readjustments occurred, and composition of spending also shifted.
How were savings achieved?	
(1) Access: relatively unaffected, according to available data.	Gross measures of access changed little or increased. Subtle factors (e.g., full range of patient choice) not measured.
(2) Quality: picture unclear, little hard evidence.	Morbidity effects mixed in PPS vs. non-PPS (waiver) states; mortality needs more analysis to find trends. Many aspects of quality unmeasured.
(3) Delivery of Care: Few clear changes are documented at level of care.	No shift to home care from CR. Staffing down relative to patients, but not shown related to CR; staffing was also declining prior to CR. Reuse up, not linked to CR. No shift among units for economies of scale, other efficiencies.
(4) "Efficiency" v. product change: more data are needed to distinguish changing product from socially desired efficiency.	Only anecdotal evidence: Units' net revenues may be down, or salaries. Staff may be lower level professionals. All manner of ancillaries may have been cut. Patient satisfaction high in 1984, but trend over time is unknown.

indications of quality problems appear in the gross measures commonly used for aggregate analysis — namely, patient survival (at least in the short run) and morbidity (which we have measured by number of hospitalizations). Both of these areas deserve more attention.

With regard to changes in the dialysis "product," only one change is well documented. Reuse of dialyzers has continued to rise among all types of units. However, it is not clear whether composite rate changes have increased the reuse of dialyzers. The largest increases in the policy of dialyzer reuse occurred before 1982 which was before the composite rate changes were even proposed. Furthermore, the recent increases in dialyzer reuse among units were not correlated to the size of the units' composite rate cuts. Units with larger cuts in payment were not more likely to switch to reuse than units with a smaller cut.

Despite concerns about patient-staff ratios, the number of patients per staff person has risen by approximately 6 percent between 1983 (composite rate implementation) and 1985. This is not too different than the rate of increase in the pre-composite-rate period. (Anecdotally, it is also said that there has been a reduction in the level of professional training of staff members, but objective documentation is not available.) Nonetheless, most dissatisfied patients when surveyed wanted more and better trained staff. (We should note, however, that dissatisfied patients were a distinct minority. See Attachment by Held and Bovbjerg 1987.) Just how else patient care may have been affected is unknown.

There are other reasons for special concern about the quality of ESRD services in the prepayment era. In ESRD and elsewhere, the composite rate and other similar "prospective" payment reforms put providers in charge of deciding how Medicare money should be spent in serving Medicare beneficiaries.[4] However, in the case of prospective DRGs for hospitals or prepaid capitation for HMOs, two structural factors help maintain quality that are missing for renal care. First, patients have an effective choice of where they receive care, day by day and year by year. Second, there is a large private market that provides a standard of appropriate quality and other attributes of service to which Medicare can be compared. "Two-tier" care can readily be identified by patients and policymakers alike. In the case of dialysis, however, patients often perceive that they have far less choice, and fully private-sector dialysis is relatively uncommon. Another part of this latter point is the generally accepted proposition that ESRD patients are, more than most other patients emotionally dependent on their dialysis unit and nephrologist and as such may be less likely or capable of exercising their rights to choose (Bovbjerg, Held, Diamond, 1987).

Truly good assessments of ESRD care cannot now be made, whether the issue is absolute quality or changes in service. One impediment is that most attributes of dialysis and other services go unmeasured. Existing aggregate measures are rather crude. Better data collection will help here and can be expected once the Congressionally mandated National Registry of renal patients becomes operational.[5] But, beyond better monitoring, an assessment ultimately calls for a public standard of desired care. Many different tradeoffs can be made of cost versus qualitative characteristics of dialysis, for example. Surely there is public consensus that ESRD patients should receive more than the technological minimum of care needed to prolong life.

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[4] Medicare has largely eschewed patient-oriented incentives; see discussion in attachment 6.

[5] NIH is seeking a contractor as this is written; see NIH/NIKDDK 1987.

But how much more? Perhaps the least expensive way to provide dialysis would be to have one very large unit in each area. Is that desirable? Just what complex of services called "dialysis" or "hospitalization" does society want to purchase for patients with ESRD? In care for victims of chronic renal failure as in other areas of service,[6] policymakers need to go beyond cost concerns to cost-benefit calculations. Reports like this one are a start, but only a start.

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6. See Kemper et al. (1987) for a similar point made about community care for the frail elderly.

I. INTRODUCTION: THE ESRD PROGRAM AND THE "COMPOSITE RATE"

A. Overview

In 1983, ten years after the inception of the ESRD (End Stage Renal Disease) portion of Medicare, HCFA (The Health Care Financing Administration) implemented a major change in the way it pays for outpatient dialysis. This single type of lifesaving service dominates Medicare spending for this group of beneficiaries, accounting for some 45 percent of total Medicare cost. The goals of the change were to achieve program economies by reducing average payment rates and by promoting home dialysis, the latter thought desirable also on quality grounds. Further cuts were proposed, then implemented by HCFA in late 1986, but were retroactively rolled back to nominal levels by the Congress. (For more detail and institutional background on this history, see section II.A below.)

Congress also mandated a study of composite rate effectiveness, with a report due no later than 1 January 1988 (U.S. Congress, 1986). This document contributes to that report. It consists of a relatively short report-in-chief followed by numerous technical appendices and attachments. The former covers all the major issues, and the latter buttress our observations with supporting detail and documentation.

We primarily focus on only part of the Congressional concern—the facility payment changes, and not as directly on the nephrologist changes. The designated focus is on the impact of the first composite rate reduction and an assessment of reuse. (Notice of HCFA award, 15 June 1987). However to a significantly lesser extent we provide limited data and observations regarding the changes in nephrologists' payments which occurred at the same time as the changes in composite rate.

B. Layout of Report

SECTION II provides background information on the history, goals, and policy context of the composite-rate changes. To fully appreciate the analyses and findings, one needs to understand what shifts were expected to occur and what other policy changes occurred simultaneously and thus also may have influenced events. SECTION III presents the main assessments that can now be made of the composite-rate changes. The discussion covers the effects of the composite rate on (a) access, (b) cost, and (c) quality, including impacts on patients, program, and providers. This section provides a point-by-point discussion of the various sub-issues of these complicated matters.

Because the second round of changes was implemented only a year ago (and then readjusted early in 1987), the current presentations concentrate on the 1982-83 set of changes. Even these in some cases must be regarded as preliminary, both because lags in data reporting and entry can make recent information less complete than historical data and because the first draft of this report had to be produced in three months. Although it is too soon to assess the second round empirically, some judgments may occasionally be drawn based on prior experience. The report attempts to indicate the level of our current knowledge about each point discussed.

C. Data

The information for this project derive from several sources. Medicare approved charges, hospitalizations, hospital days, and patient days at risk i.e. Medicare eligibility in a given time period, all derive from the claims and ESRD information maintained by the Health Care Financing Administration of the US Department of Health and Human Services.

Counts of patients and Medicare approved ESRD providers derive from the annual Facility Survey conducted by HCFA. Another count of providers and patients as well as data on the policy of dialysis units regarding reuse of dialyzers and the staffing of dialysis units are from the annual surveys (1981 was missed) of the National Center For Disease Control_(CDC).

Information on the attitudes of Medical directors, availability of treatment times, and the acceptance of new patients were gathered by the Urban Institute in 1982 and 1984.

Utilization information such as claims for medical services represent an accretion process in that all claims do not make their way through the system at the same rate. The process can be quite lengthy especially for the last 20 percent of claims and except in the case of many years after the fact one can never be positive that all claims have been added to the HCFA files. For example, in 1990 experience suggests that one can be reasonably certain that all claims have been filed and processed for 1984. However in 1986, one is less certain of the 1984 data. In the current case the claim files used were those in the HCFA system by June 30,1986. While this is a respectable 546 days following the last day of service for 1984, there is still some chance that the 1984 data are not complete. Past experience suggests that missing data might amount to less that 5 percent. But there were numerous changes to the payment system in 1984 and it is not entirely clear what the final delay in claims processing will turn out to be when enough time has elapsed to definitively state that all the data are in the system.

For reasons that are not clear at this time, it appears that physician and other Part B services, that are not provided by institutions such as dialysis, are a special case in terms of delays in reporting and completeness of data. Apparently substantial numbers of these claims were not processed or sent to HCFA for 1983 and 1984. As a result changes in the payments for physicians between 1982 and 1984, as reported in this research, are not reliable. Unfortunately, this problem was discovered late in the process of preparing this report and not all documents could be corrected to reflect this data problem in time to meet the mandated deadlines. More detail on this issue is provided below.

II. BACKGROUND FOR COMPOSITE-RATE ISSUES: PAYMENT CHANGES AND POLICY GOALS

A. The Evolution of the Composite-Rate Approach

From its beginning, the Medicare program paid essentially a fixed rate to "free standing" (or "independent") dialysis units.[7] This uniform national rate allowed $138 per dialysis treatment, and Medicare paid 80 percent of that amount under Part B.[8] Just what complex of services and supplies was included in one dialysis "treatment"—and hence could not be billed for separately on a fee-for-service basis under Part B—had to be determined by administrative action and intermediary interpretation.

This $138 level was based on the fragmentary cost experience of the few institutions that were providing dialysis treatment before Medicare extended coverage to ESRD beneficiaries. The basic rate remained unchanged for ten years, covering almost all free standing units and some hospital-based units. Many hospital units, however, were paid incurred costs—at ever-higher levels—because they had "exceptions" to the national fixed rate.[9] For all in-unit dialysis, an additional $20 was allowed for home-training sessions. Most patients dialyzing at home (and suppliers dealing with them) were reimbursed actual costs (subject of course to Part B cost sharing), not including any allowance for labor from a spouse or paid aide. Except under a little-used optional program, dialysis units were not involved in payment for home dialysis.[10] Physicians supervising routine dialysis also had special payment rules, but for all other Medicare-covered services, normal Medicare payment principles were applied. ESRD beneficiaries of course use considerable inpatient care and other such services, as well as renal care.

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[7] This short description of ESRD payment practice necessarily oversimplifies somewhat throughout. For example, with regard to this "fixed rate," it is more precise to say that Medicare set a single national "screen" or ceiling that applied to charges submitted by free standing units and to costs incurred by hospital-based units. Hospital units that could justify higher costs could be reimbursed at the higher level through an exceptions process, as noted below. In practice, it appears that only two free standing units out of the many hundreds in operation were not paid the screen amount, although as it happened both served quite large numbers of patients. By a quirk of historical accounting and charge control, one New York unit was paid less than the screen amount. And through an exception, one other unit was paid at a higher level.

[8] The amount was $150 if the physician charge for supervision of routine dialysis was included in the facility payment, as it was in the so-called "initial" method of payment when the program began. The "alternate method" for physician payment was created soon thereafter (also called the "alternative reimbursement method," or ARM). It allowed each unit's physicians the option of accepting capitation payments made separately from the unit's payment, going directly to a physician billing account for each physician supervising routine in-unit dialysis for a patient. (More than one physician could use the same billing account). This choice of payment method has now been ended; all physicians are currently paid a monthly capitation rate separate from the dialysis unit payment. As of this writing, a new procedure to reinstate the "initial method" of compensation is under consideration.

Prospective payment was thus implemented for most dialysis services (for units without exceptions) long before it was even proposed for inpatient hospital care in Medicare generally. The result of an unchanging prospective dialysis payment rate was that the payment level actually declined over time in real terms. Because most patients are dialyzed in free standing units, real spending per patient also held remarkably steady throughout a time of very high medical inflation.

Nonetheless, concerns remained that payment levels were higher than dictated by the public interest. Two types of evidence—from accountants and from the market—supported this belief: First, audits showed that according to HCFA rules, providers were being paid more than their average costs and that hospital costs were, not surprisingly, rising in uncontrolled fashion (Federal Register, 12 February, 1982; 11 May 1983).

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[9] By 1982, when the composite rate was first officially proposed, the national average for outpatient hemodialysis was reportedly $159 for hospital based units. See Federal Register, 12 February, 1982.

[10] The option was called a "target rate," which was a kind of precursor of the composite rate.

Second, it appeared that the "going rate" was more than ample to attract the desired supply of services (ibid.). Indeed, only certificate of need and other planning limits seemed to hold down entry by new units or expansion by old ones (Bovbjerg, Held, and Pauly, 1982).[11]

Simultaneously, it appeared that there was a shortage of home dialysis, which was deemed doubly unfortunate. First, audits counted home costs as lower than facility costs; second, many believed that home patients were more self sufficient and had better results (Rettig, 1982; U.S. Congress, 1978, 1981). By the end of the decade, a consensus was growing that a more efficient payment system was needed (ibid.). Acting under 1978 legislation, HCFA proposed an explicitly prospective rate reform in 1980 (Federal Register, 26 September, 1980) but its proposal was preempted by a new Congressional directive (U.S. Congress 1981).

In February 1982, HCFA accordingly proposed a so-called composite rate for dialysis, to achieve the twin objectives of cost containment and promotion of home dialysis. Most importantly, the overall average rate per dialysis was reduced, and several other changes were made as well (see subsection B following). The proposed cuts unleashed a firestorm of resistance by providers and patients alike. After 18 months of political protests and legal objections, the new rates were put into effect in August of 1983, basically unchanged, although there had been small adjustments (Federal Register, 13 May, 1983). Accordingly, knowledge of the impending changes may have begun to influence behavior any time during February 1982–August 1983, with payment actually changing on the latter date.

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[11] A GAO report (July 1986) subsequently noted that numbers of dialysis stations had increased even faster than the number of units, but more slowly than the number of patients during this period. It did not draw conclusions for want of evidence about percentage of treatment capacity used at each station.

Despite dire warnings of impending disaster, there were neither wholesale closures of units nor major disasters on the quality front. Encouraged by these non-events, HCFA decided to reduce the rate once again, so proposing in May 1986 (Federal Register, May, 1986). Again, protests arose, but were denied. The new rates constituted approximately an additional five to six percent cut on an average basis. They were implemented at the beginning of the federal fiscal year, that is, on October 1, 1986.

A coalition of patients and providers expressed concern about the effects on quality, and Congress retroactively reduced the amount of the average cut to $2 per treatment or approximately 1.6 percent (U.S. Congress 1986). It also called for a study of the effectiveness of these reductions, as noted above.

B. The Composite-Rate Changes: Specific Provisions and Goals

The composite rate embodied several key changes in prior practice: First, home dialysis and in-facility dialysis were to be paid the same, prospectively determined amount. The allowable level was to be a "composite" estimate of the combined average costs at the two types of sites. (This meant a considerable increase for home care and a decrease for in-unit care.) And all dialysis units were to be motivated to economize by being allowed to keep any savings below the prospective payment.[12]

Second, the composite-rate level was based on the expectations that home care was cheaper and that patients would migrate there (or be channeled there by cost-conscious dialysis operators). The average rate for dialysis was therefore lowered considerably. On average, the cut was from about $138 per dialysis for independent units to about $127, even more of a cut for hospitals, which on average were to be allowed only about $131 per treatment. (Our discussions will typically ignore the "80 percent of allowable" refinement, following general usage.)

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[12] In the long run, however, as also for hospital DRGs, future increases in the average payment level were to be based on aggregate costs, so that the whole industry's economizing would slow future rate increases.

Third, essentially the same rate was to be paid for hospital-based and for independent dialysis. A slight differential (about $4 a treatment more for hospitals) was to be maintained in the basic rates, in accordance with Congressional dictates that the rate-setting method should be a "dual" one. The exceptions process was maintained, but the standards for receiving a higher payment level were tightened considerably. Because so many hospital units had previously had higher rates under exceptions, the basic rate cut was therefore much higher for them than for free standing units.

Fourth, payment was no longer to be uniform nationally, but rather tempered by local-wage-index adjustments. (Thus, it is a slight misnomer to refer to "the" composite rate in the singular. Indeed, the multiplicity of the new rates across areas creates a differential impact of the cuts by area, which allows analysis of cross-sectional variation in impact.)

The goals and expectations embodied in the composite rate follow these changes. (See Bovbjerg and Held, 1982, for more detail.) The primary goal seems to have been to lower Medicare spending. (This is certainly how the dialysis industry perceived the change.) In the first instance, savings were to derive from the average price cut imposed. In the longer run, the expectation was that rewarding economizers would induce further cuts or at least moderate the rate of future increase in costs. Movement of patients home was also meant to save in the long run. HCFA payments would not be less for home patients than in-unit ones (under the composite rate, unlike the earlier system, the payments would be exactly the same). But units would have lower costs for home care and would therefore not be able to seek exceptions or lobby for increases in the future.

Home care was also to be promoted in its own right, as a superior modality for those who could use it. The composite nature of the new rate made the same resources available for home care as for in-unit care, thus removing earlier disincentives for home treatment. The payment for physicians' supervision of home dialysis was also brought up to the in-unit level (which was itself lowered). All dialysis units were encouraged to "profit" from managing home care. Also relevant to the growth of home care was the newly formal provision in the composite-rate regulation that Continuous Ambulatory Peritoneal Dialysis (CAPD) was to be paid at a rate calculated to yield the same revenue as three-times-a-week hemodialysis, roughly the industry standard at the time. CAPD was not common in 1982, but was a rapidly emerging technology.

With regard to equal access to care, the regulation struck a balance between the HCFA and Congressional viewpoints. The HCFA view (as expressed in its 1980 proposals) had been that a single uniform dialysis rate was appropriate for both hospitals and free standings (although the proposal had not affected the lower rate for home care). Congress, however, had expressed strong concerns about hospitals' having high-risk beneficiaries "dumped" on them. A differential was thus created in favor of hospital units, but only a small one; and the exceptions process was maintained, but in more restrictive fashion.

C. How the Composite Rate Relates to Other Policy Changes

These payment changes for dialysis did not occur in isolation. This same period saw many other changes, both in Part A and Part B. Some were directly targeted at renal services; others affected ESRD patients and providers as part of more general reform of overall Medicare practice. With regard to renal services, both sets of composite rate regulations were accompanied by changes in the method of payment for physicians providing routine supervision of dialysis. The 1983 regulations ended the "initial method",[13] eliminated prior distinctions between home and in-unit patients being supervised, and reduced the area-by-area capitation levels allowed.

Simultaneously, administrative changes also altered payment for renal services. On the outpatient side, there were reinterpretations of what services could not be billed for separately from dialysis itself. On the inpatient side, procedure coding and other changes affected billing by physicians serving ESRD patients.[14]

Two other program-wide changes were very significant. One affected payment for all inpatient hospital services. Hospital-specific prospective payment began during 1982-83 under TEFRA (The Tax Equity and Fiscal Responsibility Act of 1982); and the Prospective Payment System (PPS) by DRG (Diagnosis Related Groups) began to be phased in during 1983-84 (U.S. Congress 1982, 1983), only months after the implementation of the first composite rate changes. Professional Review Organizations (PROs) also began operations during this period. Mid-1984 saw the beginning of the general physician fee freeze. In a non-payment-related change, health planning requirements generally and certificate-of-need programs specifically were considerably weakened, at both federal and state levels. This deregulatory trend began to ease the entry of new units and expansion of old ones. The role of the ESRD Networks—meant to be watchdogs of quality of care—was also in flux during this period, as was their funding.

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[13] See footnote 3 above.

[14] Unfortunately for analysis, most of these administrative decisions were not implemented uniformly nationwide at a single point in time. Rather, different intermediaries acted differently.

Some of these developments can be distinguished from the composite rate in their effects on behavior because their expected effects go in different directions. (For example, the composite rate cut might be expected to increase hospital use because some more expensive treatments could be shifted to inpatient care.) Most of these developments, however, cannot be completely separated from the effects of the composite rate for purposes of before-and-after analysis.

Finally, one should also note other developments at the state level. Most importantly, Medicaid and state kidney programs often cover Medicare's cost sharing (and sometimes other services, such as transportation and outpatient drugs, not covered by Medicare). It would be good to take account of shifts in such programs, which can significantly influence provider and patient behavior. Unfortunately such data do not exist at the national level. These inquiries are among the list of issues that would be informative in a complete analysis of the changes in the ESRD program but which are beyond the scope of this current endeavor.

III. ASSESSING THE IMPACTS OF THE COMPOSITE RATE: AN EMPIRICAL STATUS REPORT

A. Approach of the Analyses

For purposes of discussion, it is convenient to separate possible effects into impacts on access, cost, and quality. Almost all public concerns fit rather neatly within this framework. This report considers them in that order. Thereafter, the report considers effects on providers and the structure of the dialysis industry, which are of less direct program relevance, but of interest to policymakers.

Our general approach to each type of issue is first to present relevant aggregate statistics, sometimes together with qualitative information. More detailed and controlled analysis generally follows, sometimes in the appendices. Many apparent trends or effects cannot be understood without controlling for patient case mix, patient days at risk, and some other factors, both in tabular presentation and multivariate analysis (the latter mainly in appendices).

1. Cross-sectional and Time Effects.

We treat the imposition of the composite rate as a kind of "natural experiment" because it did not affect every unit and every geographic region in a uniform way. That is, our assessments can go beyond only longitudinal analyses (before and after the rate changes)—which tend to be clouded by all the other payment and policy changes occurring at the same time, as just noted. We can also do cross-sectional analyses, based on the different amount of composite rate change in different areas for different units. (For example some 59 independent units experienced no reduction from their prior per-dialysis rate. And even within the same area not all units had the same change since many had exceptions to the "screen" and consequently their composite rate change may have been quite different than that experienced by a similar nearby unit.) Thus, a basic thread running throughout the following discussion is to see how observed changes in behavior correlate (or do not) with the amount of the composite rate change (delta-P, for price, as the analyses refer to it) with other covariates including the year effect equal.

Separation of the time and cross-sectional impact of the composite rate change is so central to much of this analysis that it bears repeating. Consider that in comparing the impact of the composite rate change that there will be some changes that are correlated with time. For example, the PPS program was instituted at the same time across all the US. The impact of this change will be correlated with the set of covariates measuring time and in this analysis will be measured by the change from 1982 to 1984. This will be the time effect. In addition the analysis will estimate a separate effect which will ask, given the change correlated with time, what differences are observed for patients or units which had a large change in composite rate compared to patients whose unit had a small change in composite rate? Do we observe that there were different impacts when one compares those patients whose unit had a large cut with patients whose unit had a small cut. This latter effect is referred to as the cross-sectional effect.

2. Waiver vs. PPS States

Another kind of "natural laboratory" exists that was incorporated into the analysis to control for the confounding effects of the changes in hospital payment. The four "waiver states" running state all-payer rate setting programs were not under PPS/DRGs and hence did not undergo those changes at the same time as did the rest of the nation. Consequently, analysis of shifts seen there under composite rate can help to eliminate the DRG influence on the analysis.[15]

It is painstaking to control for all these factors. And results may sometimes appear to be unnecessarily complex and hard to interpret. But the robustness of results is considerably improved by this effort.

B. Effects on Access to Care

As noted, HCFA's own analysis of trends in numbers of dialysis units and in applications to open new units convinced it that the composite rate in no way threatened access. Our various analyses generally tend to confirm this expectation, with some qualifications. Access does not appear to have been significantly compromised by the 1983 reduction in payment levels. (It is much too soon to observe post-1986 changes.) Anecdotally, one hears that there have been some shifts within the industry, especially in that hospital-based units have converted to free-standing. But it would appear that the supply of dialysis units was not reduced as a consequence of the composite rate change. We present relevant data on various measures of access.

1. Numbers of Dialysis Units

Figure 1 graphs the rate of increase in numbers of ESRD units. The data come from two different "near censuses" of units—the annual Facility Survey by HCFA (data submitted by units via the ESRD Networks) and the related survey by the Centers for disease Control (CDC). For technical reasons, the precise counts differ between the two data sets, but the story they tell is the same.

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[15] The states with federal waivers from having their hospitals paid under the DRG system were during this period Maryland, Massachusetts, New Jersey (whose state DRGs were quite different from the federal ones), and New York. It is not clear whether there were specific changes implemented in each or any of these states that might have complicated this analysis but the general impression is that the changes in these states were quite different than that which occurred in the PPS states.

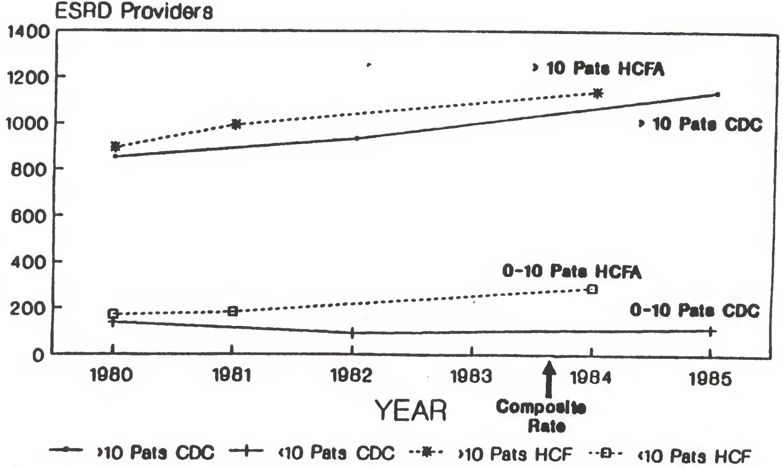
Throughout the 1980-85 period, there has been a rise in the total number of ESRD units and patients each year. To control for the possibility that inactive or relatively inactive units are driving this increase, the data were disaggregated into units with over 10 patients and those with 10 or under. Only the 0-10 patient units as reported to CDC fail to show the same increasing trend. (In part it may be that units or institutions with Medicare "approved units" but no patients do not respond to the CDC survey.) Furthermore, if one focuses only on units with 10 or more patients, the CDC data suggest that the rate of increase in the number of units is higher in the post-1982 period (after composite rate was announced) than in the pre-1982 period. The annual rates of increase were 4.8 percent and 6.8 percent, respectively.

Although these totals show an increase, it is not clear whether data on the number of dialysis stations and units are available in the appropriate fashion for further analysis. Variation by region may also be an issue, which could conceivably relate to differential impacts of the composite rate. And some accounting needs to be made for the changing profile of dialysis patients (increasing diabetics and CAPD, for instance) and technology (often shorter dialyses) that affect the perceived need for stations and units.

It also seems desirable to consider CON and planning in this context, since planning limits could have impeded growth in some areas and not others. Such work remains to be done, if it is even feasible from existing measures of planning variables.

ESRD Providers

CDC and HCFA, 1980-1985



Data are form CDC Control and
HCFA's Facility Survey

FIGURE 1

Another way of considering access to units goes beyond a count of units or stations to ask whether patients had access to a nearby unit. A particular concern is that rate cuts would be especially hard on small units because there are striking economies of scale in the production of dialysis (Held and Pauly, attachment 4). The fear is that large units would grow, while small ones were forced to close or selectively turn away high cost patients. Figure 2 provides indirect evidence that these phenomena did not occur.

The "Lorenz like" diagram plots the percentage distribution of patients across units (the small ones at the left, big at the right). If all units were the same size, 20 percent of the units would have 20 percent of the patients, and so on up to 100 percent of each; this line of "equal distribution" forms a 45-degree angle, rising diagonally across the Figure. The actual distributions in 1980[16] and 1985 were so similar that they form a single curve lying below the diagonal. (In this type of presentation, the farther the curve from the diagonal, the more unequal the distribution.) In each case, the smallest 50 percent of units had under 15 percent of the patients. In sum, there were almost no shifts at all in concentration by size of unit, even though units did grow in size on average.

Further corroboration of continuing access comes from the continued growth of the numbers of patients with ESRD in the aggregate. After all, the "worst case" of an adverse effect of lower payment would be that providers might cut back on all new patients or selected groups of new patients. Of course, it is well known that the numbers continue to grow. See Figure 3 below. Although the Figure's data present only in-center patients, adding home patients does not materially affect the picture. Home patients, as will

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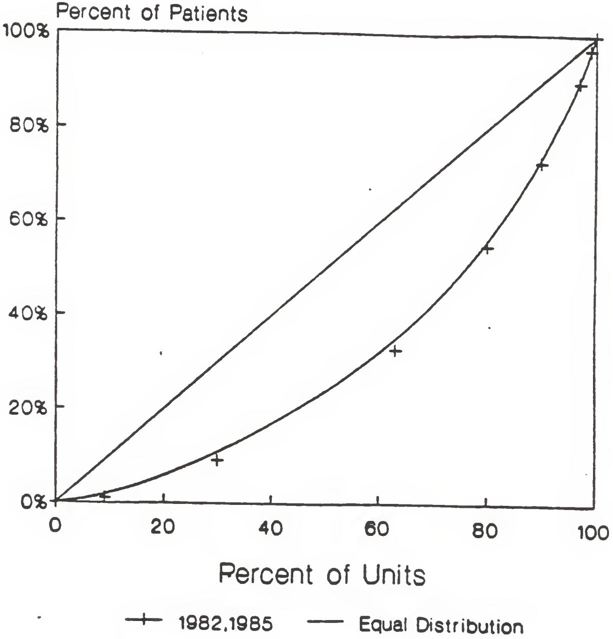
[16] While 1982 might have been more appropriate for the precomposite rate period in actuality the 1982 and 1980 data are so close that it does not make a difference which year is used as a baseline.

Concentration of ESRD Units by Size, 1982,1985

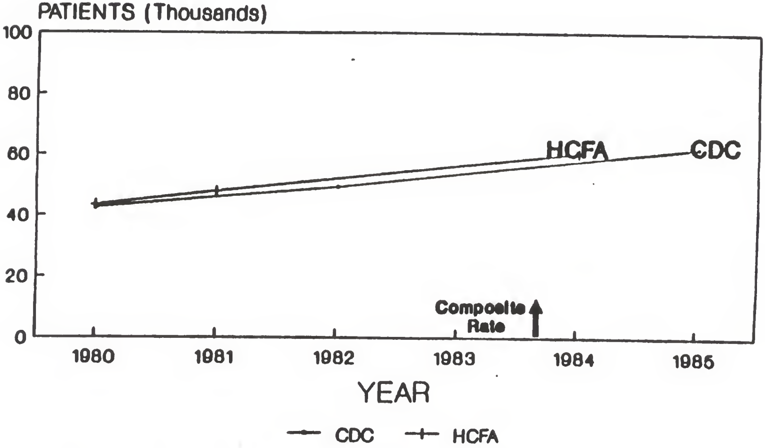


Data are from CDC's Annual Survey.
Excludes providers with 0 patients.
Patients are of the last week

FIGURE 2

In Center Dialysis Patients

CDC and HCFA, 1980-1985



Data are from CDC and HCFA's Fac Survey.
Both are for the end of the calendar yr.
Patients include Medicare and Non-Med.

FIGURE 3

be seen below, have risen even faster than total patients when CAPD patients are included.

2. Units' Reports of Other Relevant Access Measures

Even if total patients continue to rise, one cannot be sure that access is maintained, depending upon what happens to access for various subgroups of patients under different circumstances. For instance, one might hypothesize that identifiable high-cost patients would be less often treated or at fewer facilities. Conventional wisdom and analysis of HCFA cost data (Held and Pauly 1985) show that patients with diabetes, for example, are in this category. Diabetics continue to grow in numbers in the ESRD program.

Table 2 presents data from two national random surveys of dialysis unit medical directors, one before and the other after the composite-rate changes.[17]

The following conclusions emerge from the Table:

(a) More costly or "difficult" patients do not seem to be losing access. Measured as a proportion of units accepting patients of each type, access is either up or little changed for patients with hepatitis, blind diabetics, those with angina or cardiac abnormalities, very old patients (over 70) or children (14 and under). Statistically, the most significant finding is that about one sixth more units said they were taking angina/cardiac patients in 1984 compared with 1982.

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17. These two surveys by Philip J. Held of The Urban Institute differed slightly in content and significantly in sample frame. The first Survey of Dialysis Institutions (SODI 1) covered all units regardless of size or location and included more than half of all active units nationwide. SODI 2 was more in depth but sampled fewer units; only large metropolitan areas were covered, as well—although such areas account for about 65 percent of all dialysis patients, so they can hardly be considered unrepresentative. For hypothesis tests, then, it is necessary to control for large urbanness difference between the two surveys. While these data are self reported information there is no obvious reason to suspect bias in reporting.

Table 2

Changes in Measures of Access to Dialysis Services, 1982, 1984^a

(CR is Composite Rate)

Measure of Access (Medical Director Reponses)	Average	Hypothesis Tests			
		1984 different than 1982(%)		Correlated with CR Change (%)	
		amount	(P)	yes/no	(P)
1. Accept Patients (% yes):					
A. Hepatitis	61	-5	(<0.42) no change	No	(<0.36)
B. Blind Diabetes	99	0	(<0.62) no change	No	(<0.72)
C. Angina/Cardiac Abnormalities	89	18	(<0.01) better	No	(<0.60)
D. Elderly >70 yrs old	99	1	(<0.40) no change	No	(<0.81)
E. Children, <14 yrs old	45	-1	(<0.84) no change	No	(<0.81)
2. Want More Patients (% yes)	83	5	(<0.34) no change	No	(<0.13)
3. Have capacity for More Patients (% yes)	74	1	(<0.87) no change	No	(<0.54)
4. Opinion: Patients have choice of >1 unit:					
A. Always	45	12	(<0.08) better	No	(<0.69)
B. Always/Sometimes	73	7	(<0.19) no change	No	(<0.83)

Table 2 (continued)

Measure of Access (Medical Director Reponses)	Average	Hypothesis Tests			
		1984 different than 1982(%)		Correlated with CR Change (%)	
		amount	(P)	yes/no	(P)
5. Dialysis Shifts operating at capacity (% yes):					
A. All shifts	31	-.3	(<0.96) no change	No	(<0.63)
B. All/Some shifts	90	1	(<0.90) no change	No	(<0.54)
6. Patient Services (% yes):					
A. Free Transportation	17	-8	(<0.13) no change(?)	No	(<0.26)
B. Individual TV's	52	9	(<0.19) no change	No	(<0.31)
C. Evening shifts	62	5	(<0.42) no change	No	(<0.44)

a. Sample size is approximately 696 total, of whom 79 percent were in 1982. Hypothesis tests control for large urban area.

(b) Over three quarters of units reported before and after composite rate that they want more patients. Almost as many say they have capacity to handle more patients, with no measurable difference after composite rate. As corroboration, only a third of units report that all of their shifts are operating at capacity (and there is no change after composite rate); nor is there change in the additional proportion for whom some shift(s) are at capacity.

(c) Evening shifts are becoming somewhat more available. Evening shifts can be quite important to many patients, particularly those who want to remain employed (see Held and Alexander 1985). Access to them merits special consideration, apart from being able to get some shift at some point in the day. Again, the proportion offering evening shifts did not appear to change after composite rate.

(d) Most patients continue to have realistic access to multiple units. On average, about half of the medical directors express the opinion that patients in their areas can "always" choose among more than one dialysis unit (45%); again, the proportion has risen (by 12 percentage points) after composite rate although the P value (0.08) is higher than the usual 5 percent criterion. The answers for "always or sometimes" have not changed overall when comparing before and after the composite rate.[18]

(e) Other measures. Finally, in a shift that might increasingly affect access over time, fewer units report that they provide free transportation after composite rate than before (average rate 18 percent; post-period 8 points lower—but not statistically significant ($p < 0.13$) under usual criterion).

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[18] Some would argue that even if patients have a choice among units they may not have a choice among units that reuse and don't reuse dialyzers. This option was not explored in this analysis.

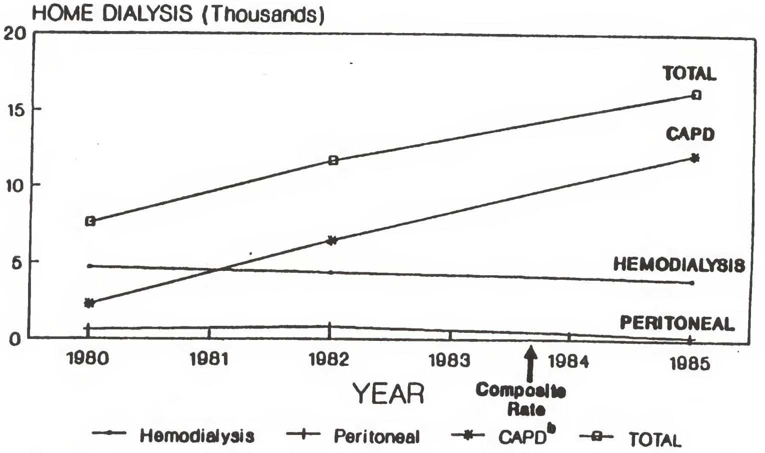
Note on Statistical Link to Composite Rate. All the just-cited access measures have been presented as before-and-after comparisons i.e. 1984 compared to 1982. But the data presented on the right side of Table 2 also show that the "null hypothesis" of no relationship between composite rate and these changes in access could not be rejected. In other words, the hypothesis tests on the right side of Table 2 asks whether the changes in these measures of access are correlated with the cross-sectional changes in the composite rate. Are those units which had a larger change in Composite Rate more likely to have reduced access than are the units which had a smaller change in Composite Rate? The results in Table 2 suggest that one cannot give statistical credence to any link between the composite rate changes and the reported changes in access.

3. Access to Home Care, Modality of Choice

Given that a central goal of the composite rate changes was to encourage home care, a major question is whether more people have access to a home care modality (home hemodialysis or CAPD) and whether more people use it. The former version of the question is hard to address with confidence. It is easier to count the number of users of home care than the number who might use it but do not choose to.

Figure 4 shows the growth in raw numbers of home patients from 1980-85, using HCFA's Facility Survey data. Clearly, home patients' growth is outpacing in-facility growth but this rapid growth does not seem related to the composite rate (or any of the other coincident changes in policy). Rather, the growth seems to reflect the rapid dissemination of a new technology—CAPD, which was very small in 1980. Home hemodialysis and intermittent peritoneal dialysis (rather than continuous ambulatory) have both declined in absolute numbers, dropping even more as a proportion of the overall ESRD population.

Home Dialysis Patients, 1980-1985[a]



a. Data are from the Facility Survey
b. Continuous ambulatory peritoneal dial and continuous cycling peritoneal dial.

FIGURE 4

It would appear that home hemodialysis either lacks the cost advantage claimed for it by the HCFA auditors (on which, see Bovbjerg and Held 1982) or that home hemodialysis is simply unattractive among patients and their physicians, relative to CAPD (and perhaps also relative to transplantation, which has also increased markedly and may be a substitute for home dialysis). More analysis is needed to tease out causation here.

"Access" in the sense of full choice of treatment modality (perhaps without the need to change units) can be quite important to patients. In particular, some patients strongly desire not to have to "reuse" dialyzers or the accompanying blood lines.[19] Most units that reuse do so for all or almost all patients, sometimes giving non-reusers only the option of changing to another dialysis unit, which may or may not be feasible. Thus, reuse can be seen as an issue of access to desired care. And there can be no doubt that reusing units have grown enormously since the composite rate was first proposed, as we document later on. The main reason for patient concern, however, is the possible effects on quality of care from reuse. We therefore consider reuse under subsection D. below on quality impacts.

4. Access to Hospital Care

If dialysis units that are paid less for outpatient care react by trying to shift some care to the inpatient setting, whether hospitals are willing to accept (or able to refuse) those patients is of considerable importance. Patients could suffer if neither site wanted to perform certain procedures. Hospital DRG (Diagnostic Related Group) rates were calculated on an aggregate, average basis; there is no adjustment to the rate of any particular nonrenal admission (e.g., broken pelvis) to reflect the fact that a renal patient will have a higher predictable cost to hospitalize than a nonrenal one—by a minimum of the cost of continuing dialysis at the hospital's expense. It is thus hardly implausible that hospitals, other things equal, would have less preference to treat ESRD patients than to treat non-renal patients in the same DRG. If the DRG rate is high enough then all patients are financially desirable to hospitals although renal patients are relatively less desirable.[20] Work by Held, Pauly, and Bovbjerg (1986) presents an analysis of the joint results of DRGs and the composite rate (and all the other non-distinguishable changes). There appears to be no evidence that fewer hospitals take ESRD patients, that fewer ESRD patients overall are hospitalized, or that particularly demanding or expensive ESRD patients have lost out.

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[19] Our 1984 survey asked patients their opinion of reusing diayzers. Approximately one third responded that they didn't care and would leave the decision to their physician or unit. One third thought reuse was better and one third thought that reuse was worse than one-time use. See Held, Bovbjerg, 1987.

5. Risk Segmentation: "Cream Skimming" and "Dumping"

Perhaps the most subtle concern about access is whether and to what extent risk segmentation of patients occurs—and has changed, if at all. Namely, is there "cream skimming" of less costly patients and "dumping" of more costly patients in response to a lower payment rate? This analysis will require more careful multivariate analysis. At the time of the composite rate, hospital units complained that they served a "needier" population than free standing units; they persuaded Congress of the desirability of a "dual" rate system, but HCFA's small differential payment (except for the rare exceptions) shows that HCFA was far from convinced. The issue deserves more attention in future analyses.

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[20] The PPS system made special allowance for hospitals with very large patient censuses of ESRD patients. Almost no hospital could qualify for this exemption.

C. Cost Concerns

At first glance, effects on program costs appear to be rather straightforward. The payment rate per dialysis was clearly reduced, and dialysis accounts for the lion's share of program spending. But that is not the end of the story. Account needs to be taken of complicating factors as well. Have there been offsetting changes in the number of dialysis treatments per patient? Have patient care services been shifted from the dialysis unit to inpatient care (much as DRG-based hospital prepayment was expected to move patients out of hospitals, just in the opposite direction?). What effects have the known increases in patient complexity had on the expected costs?

The Congress and HCFA alike are concerned about whether the composite-rate changes have achieved the desired reductions in program spending that would otherwise have occurred. Also of considerable concern is the composition of spending and the impact on provider payments and organization.

1. Effects on Overall Program Spending and on Composition of Spending

The composite rate changes could affect program spending, in several ways, directly and indirectly. But before beginning this discussion it would be useful to restate some of the problems and cautions which are appropriate for a report prepared under such a short time schedule. The first caution has been known for some time and was mentioned above; the latter two cautions were noted relatively late in our analysis phase.

Caution No. 1. The addition of medical claims to the HCFA files is by nature an accretion process in that the data are continuously added over an extended time period. The data for 1984 may not be complete even at the time of this writing. This suggests that in general the amount of any decrease in approved charges between 1982 and 1984 is an upper bound of the true state of the world. In other words, a reported reduction of 5.6 percent may in the longer run be less when all claims have made their way to the HCFA system.

Caution No. 2. Physician and other professional services for 1984 are a particular example of the upper bound estimate discussed in the previous caution. However, it appears that the problem is more serious than just a delay in claims reaching the HCFA data center. It is clear that the physician claims for 1984 are likely to be biased low. This fact became clear late in the analysis period and as a result some of this report was written before this shortfall of claims was discovered. The data presented in Figure 4A provide a sense of the shortfall in claims for 1983 and 1984. These data show that the average number of claims per patient are down and the number of persons with no claims at all is up dramatically. Given that 1985 appears to be back on the trend line for the pre-1983 period, it suggests the shortfall was not a long term change in the trend but a temporary occurrence linked to lost claims or claims not forwarded to HCFA. This suggests that the reported decreases between 1982 and 1984 in physician approved charges (below) are a significant overstatement of any actual decline in physician payments.

Caution No. 3. The hospitalization rate by days at risk for 1982 may be biased low.[21] If true, the finding that 1984 hospitalization rate is higher than the 1982 rate may not be a true statement. Future work will need to focus on this and related issues.

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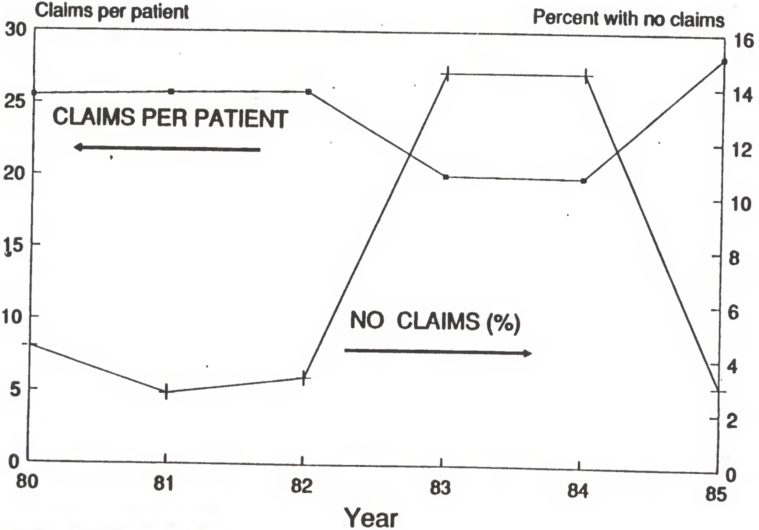
[21] The potential problem is that the time between when a patient becomes eligible for Medicare and when the patient becomes end stage can lead to an undercount of services as counted by the ESRD data system. This is most relevant for the patients older than 65 at time of renal failure. We did some recalculations using the date that a patient was added to the ESRD data system rather than the date of Medicare eligibility. The results were not changed in any material way with the change of dates.

Part B Claims 1980-1985 [1]



[1] 1.Excl dialysis and outpatnt institution

FIGURE 4 A

(a) The Levels of Cuts Imposed, Per Se. It is quite clear that HCFA in practice achieved the intended cuts in average program payments per dialysis treatment. The straightforward way to demonstrate this would be to compare listings of allowable charges or costs by unit over time. Unfortunately, although we have obtained from HCFA a listing by unit of post-change 1984 rates, no comparable listing from the pre-period exists at the national level.

In lieu of such a listing, a replacement was created synthetically from HCFA claims data for 1982.[22] Table 3 shows the parameters used in this synthesis.

Table 4 shows the sample means for approved outpatient charges, and Table 5 shows the change between 1982 and 1984. These data clearly show the large drop between it and the subsequent HCFA official listing of post-composite-rate allowances. On average the decrease was $15, which was 10 percent of the estimated 1982 average. If the HCFA estimate of $159 per treatment for hospital units in the pre-Composite Rate period is correct, the decrease achieved was larger than the 10 percent we estimated and reported in Table 5.

(b) Calculations of Allowable Charges per Patient Day at Risk. A whole series of calculations have been made of allowable charges, adjusted not

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[22] Briefly, a "clean" set of patients for each unit was created—including only patients in the program for the full year and excluding patients with inpatient stays and transplants. This meant that a full year's of outpatient dialysis was included for each. Then the total allowable charges for the year was divided by the total count of charged dialyses, to yield an estimate of the allowable level for the patient and averaged over all patients to yield an estimate for the unit. Done in the pre-composite-rate era, this process should have yielded an average of $138, the national screen, for free standing units. The actual average achieved was within 1 percent of this figure. Similar estimates were made for hospital units, for which we are aware of a possible downward bias (one, that is, that would understate the historical payment level and hence exaggerate the price cut achieved by the composite rate). This calculation of "delta P," or change in price allowed, was the basis for many subsequent analyses. Given its synthetic nature and its central role in our work, we plan additional checks on its validity

Table 3

Parameters for Developing an Outpatient Maintenance Dialysis Price, 1982

Criteria
Excluded Patients Who:
Had more than 1 dialysis provider during year[a]
Had a transplant during year[a]
Had fewer than 365 days at risk for year[a]
Had any home care sessions or charges for home dialysis care[c]
Had any CAPD sessions or charges[c]
Had self-care training or charges[c]
Were not in-center hemodialysis patients[b,c]
Had a mean approved charge/dialysis session Less Than $110[c]
In freestanding units (mean approved charge/dialysis session GT $170)[c]
In hospital units (two separate upper limits of $200 and $250 per session)[c]

a. ESRD PMMIS data
b. Full-care sessions = hemo dialysis sessions.
c. Original bills

Table 4

Sample Means for Outpatient Dialysis, "Estimated" Approved Charges 1982[a]

Patients

Unit Type		Method of Physician Reimbursement	
		Initial (less $12)	Alternate
Freestanding	Mean	134	136
	n (patients)	271	1,762
Hospital Units			
($200 cap)	Mean	144	153
	n (patients)	285	615
($250 cap)	Mean	154	158
	n (patients)	320	673

a. Estimation performed on a sample of individual patient records.

Table 5

"Estimated" 1982 and 1983 Composite Rate Outpatient Dialysis by Type of Unit[a]

	Means		
Type of Unit	1982 Approved Charge	1983 Composite Rate	Reduction 1983-1982
Free Standing	\$138[b]	\$126	-\$12.26
Hospital	"\$148"[c]	\$130	-\$18.34
Total	\$143[c]	\$128	-\$15.00

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a. Weights used to obtain total were the 1980 and 1985 patient weights respectively.

b. Ignores 2 units that had an exception, one higher and one lower than screen.

c. Estimated; is lower than the estimate used by HCFA in issuing the composite rate. Actual may have been \$11 higher according to HCFA.

merely to reflect year-end patient census but, even better, precise patient days at risk (or DAR) corresponding to these allowables.

(1) Overview — Simple Means. Basic tabulations of simple means for 1982-1984 by waiver and PPS states by general category are shown in Figure 5. Note that these are simple means and do not control for any covariates such as the local cost of medical services or differences in the composition of the patient mix.

Total approved charges per day at risk (DAR) were approximately $89 to $95, varying by area and by year. Inpatient dollars were $25 to $36 per DAR. Outpatient, including dialysis, was $46 to $50 per DAR. (Through out this report we use outpatient to refer to those part B services that are generally provided by institutional providers and exclude physician and other professional charges.) Physician charges were an additional $10 to $13 per DAR. In percentage terms outpatient was approximately 52 percent of the total; inpatient was 33 percent; physicians accounted for 13 percent; the rest (2 percent) was other charges. The ratios of 1984 to 1982 shown in Figure 5 indicate that the largest percentage reductions between 1982 and 1984 were for physicians. However as explained above (Caution 2), the 1984 estimate is likely to be biased low. [23] On average, outpatient dollars were down approximately 5 percent (0.95 in Figure 5) or half the average percentage decrease in composite rate (Table 5).

Figure 6 provides similar data but for inpatient information only. The inpatient charges for the PPS states in 1984 are most remarkable — at $36 per

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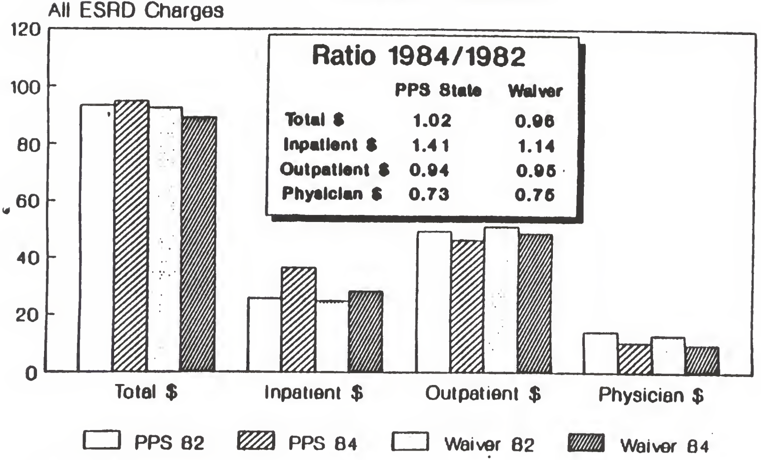
[23] In 1982, a minority of physicians were compensated for supervision of dialysis under the "initial method." These payments were included in the outpatient dialysis payment. Consequently, the 1982 mean as well as the 1984 mean for physicians is also biased low although our experience suggests that the 1982 bias is small compared to the bias due to the shortfall in claims for 1984.

ESRD Charges Per DAR*

1982-1984

ALL - SIMPLE MEANS



Ratio 1984/1982

	PPS State	Waiver
Total $	1.02	0.96
Inpatient $	1.41	1.14
Outpatient $	0.94	0.95
Physician $	0.73	0.76

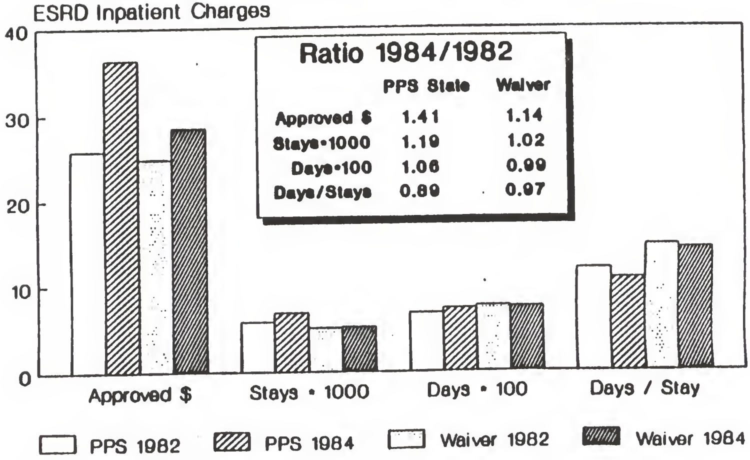
Patient Days at Risk; 1984 data may be incomplete

FIGURE 5

ESRD Charges Per DAR

1982-1984

INPATIENT - SIMPLE MEANS



Ratio 1984/1982

	PPS State	Waiver
Approved $	1.41	1.14
Stays•1000	1.19	1.02
Days•100	1.06	0.99
Days/Stays	0.89	0.97

Patient Days at Risk; 1984 data may be incomplete

FIGURE 6

DAR or up 41 percent over 1982.[24] Based on simple means, the rates of hospital stay in the PPS states are higher in 1984 than in 1982. While the days per stay are clearly down, the total days per 100 days at risk (DAR) is up in 1984 compared to 1982 — 6.5 versus 7.3. In contrast, the situation in the waiver states is notable for the lack of significant change over the 1982-1984 period. As noted above in Caution (3), these results should be taken cautiously since there some reason to think that 1982 levels may be biased low, thus making 1984 appear high.

(2) Multivariate Analysis. Tables 6-9 present results beyond the simple means presented above by considering the impact of the change in utilization and charges, with other covariates equal. These are the estimates which resulted from the change in the composite rate as well as the secular time changes, i.e., the estimate of the 1984 effect compared to 1982. These estimates are made with 29 other covariates held equal.[25] Separate estimates for the waiver and PPS states are presented. Tables 6 and 7 provide an overview of the total and the aggregate components. Tables 8 and 9 provide some specific details of the implied changes including the changes, in morbidity as indicated by hospitalizations and hospital inpatient days.

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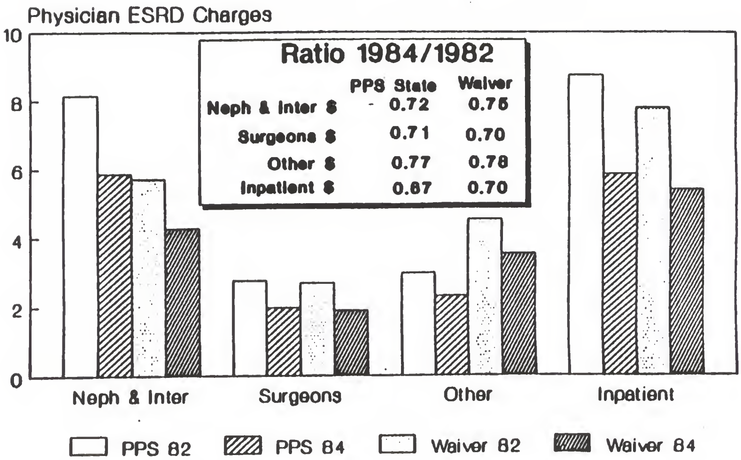
[24] This is likely to be an undercount of the true increase in HCFA spending, since the end of year payments and other DRG "passthroughs" such as capital costs are not shown in these estimates.

[25] The estimation of the Composite Rate effect used a multiple linear regression model. The dependent variables were the various measures of approved charges per patient day at risk. The unit of observation was the individual patient and PPS and waiver states were estimated separately. The covariate list included the patient characteristics and some provider characteristics. The composite rate effect was estimated as the natural logarithm of the ratio of the 1984 composite rate to the 1982 composite rate for each patient's provider. This specification leads to a quantification of the impact of the composite rate as the delta composite rate (in proportion) times the estimated coefficient. More detail is contained in an appendix.

ESRD Charges Per DAR*

1982-1984

PHYSICIAN - SIMPLE MEANS



Ratio 1984/1982

	PPS State	Waiver
Neph & Inter $	0.72	0.75
Surgeons $	0.71	0.70
Other $	0.77	0.78
Inpatient $	0.67	0.70

Patient Days at Risk; 1984 data may be incomplete

FIGURE 7

Table 6

Cost Impact, Composite Rate, and Other Changes, 1982-1984[a]

Waiver States

Approved Charge or Other/ Measure Per Patient Day at Risk	Mean 1982	Change 1982-84 (P<)	
		Secular with Time & Other	Composite Rate -10%
Outpatient (Institution)	$51.36	-7.0% (0.01)	-2.2% (0.02)
All Other Part B	15.16	-23.7% (0.01)	-0.5% (0.88)
Inpatient	24.85	1.0% (0.91)	2.8 (0.59)
Total	91.37	-7.6% (0.05)	-0.6% (0.74)

a. 1984 data may be incomplete. Thirty-one total covariates.

Table 7

Cost Impact, Composite Rate, and Other Changes, 1982-1984[a]

PPS States

Approved Charge or Other/ Measure Per Patient Day at Risk	Mean 1982	Change 1982-84 (P<) Secular with Time & Other	Composite Rate -10%
Outpatient (Institution)	$49.43	-3.6% (0.01)	-1.1% (0.09)
All Other Part B	17.59	-24.8% (0.01)	-7.8% (0.01)
Inpatient	25.79	43.4% (0.01)	-5.2% (0.13)
Total	93.47 (0.01)	5.4% (0.01)	-3.5%

a. 1984 data may be incomplete. Thirty-one total covariates.

Table 8

Changes In Selected Indicators and Composite Rate, and Other Changes, 1982-1984[a]

Waiver States

Approved Charge or Other/ Measure Per Patient Day at Risk	Mean 1982	Change 1982-84 (P<)	
		Secular with Time & Other	Composite Rate -10%
Hospital Stays	0.005	10% (0.31)	-3.4% (0.44)
Hospital Days	0.076	-17% (0.15)	-2.6% (0.61)
Number of Dialysis Treatments	0.30	7% (0.01)	-1.3 (0.16)
Outpatient ($) Clinic	0.16	16% (0.44)	-19% (0.55)
Laboratory	2.92	-19% (0.01)	-0.06 (.04)
Blood	0.14	74% (0.05)	19% (0.28)
Nephrologists ($)	5.72	-29% (0.01)	0.3% (0.28)
Surgeons ($)	2.70	-19% (0.07)	-6% (0.20)
Other Physicians ($)	4.55	-5% (0.58)	4% (0.38)
Physicians In Hospital ($)[b]	7.78	-24% (0.01)	-2.2% (0.60)

a. 1984 data may be incomplete. Thirty-one total covariates.
b. Included in the other physician categories.

Table 9

Changes In Selected Indicators and Composite Rate, and Other Changes, 1982-1984[a]

PPS States

Approved Charge or Other/ Measure Per Patient Day at Risk	Mean 1982	Change 1982-84 (P<)	
		Secular with Time & Other	Composite Rate −10%
Hospital Stays	0.006	10% (0.01)	−12% (0.67)
Hospital Days	0.068	−1.2% (0.81)	−2.5% (0.41)
Number of Dialysis Treatments	0.30	10% (0.01)	−6.7% (0.37)
Outpatient ($) Clinic	0.16	50% (0.01)	−20% (0.04)
Laboratory	2.92	−37% (0.01)	−2.2% (0.30)
Blood	0.20	50% (0.01)	−9% (0.06)
Nephrologists ($)	8.15	−23% (0.01)	−10% (0.01)
Surgeons ($)	2.78	−19% (0.01)	−0.8% (0.04)
Other Physicians ($)	3.00	−16% (0.02)	+1.1% (0.79)
Physicians In Hospital ($)[b]	8.72	−25% (0.01)	−5.6% (0.10)

a. 1984 data may be incomplete. Thirty-one total covariates.
b. Included in the other physician categories.

As discussed in the Introduction (Section I) and in an appendix, by estimating a separate effect for time and for the composite rate change, it is more likely that the composite rate change can be separated from the secular time effect. In addition, there is reason to believe that analysis of changes for patients resident in waiver states offer a greater chance to sort out the effects of the composite rate and the physician rate changes separate from the PPS changes. While these tables show the right column as the impact of a ten percent change in the composite rate, it would be more complete to indicate that this is the impact of the composite rate change and anything that is correlated with it.[26]

The separation of the impact of policy changes into the time and composite rate changes may deserve more discussion. Consider that there were a number of changes that occurred between 1982 and 1984. The average of these changes is measured by the "secular with time and Other" shown in Tables 6-9. The second effect (composite rate) asks if time and other covariates are held constant, and one examines the impact where the composite rate change was large compared to where the composite rate change was small (or even positive) does one observe an impact that is correlated with these cross-sectional effects? For example, in Table 6, the -7.0 percent ($p < 0.01$) indicates the impact of all the changes in outpatient charges combined between 1982 and 1984. The -2.2 percent ($p < 0.02$) indicates that in addition, where the composite rate changes were -10 percent larger than average, the outpatient charges were down another 2.2 percent.

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26. A likely possibility is the change in physician payments could be correlated with the change in composite rate. To the extent that the two are correlated the change reported here for composite rate actually reflects the change for both policy changes. If these two changes are not correlated then the change for composite rate reported here is not influenced by the change in physician payment.

Overall, there was not much change in the inpatient hospital charges in the waiver states (Table 6). Note that the impact of both changes, time and composite rate, were not statistically significant. In the aggregate total account the composite rate change was not statistically significant. The composite rate effect was statistically significant for outpatient services, although the effect was fairly small.

The composite rate effect for the PPS states (Table 7) shows basically a similar pattern as for the waiver states, although the effect for the non-dialysis Part B is statistically significant ($p < 0.01$). It was not statistically significant in the waiver states. The major difference in the changes in approved charges between the PPS and waiver states lies in their inpatient hospital charges which were substantially higher in the PPS states. Total inpatient approved charges are higher in the PPS states in 1984 than in 1982 by 43 percent. As a consequence, total approved charges are higher in the PPS states, while in the waiver states total charges were lower in 1984 compared to 1982.

Detail for selected indicators are shown in Tables 8 and 9 with the same format as for the first two tables. As reported for the simple means, the inpatient days and stays for the waiver states do not show any particular relationship to the time (1984) effect or the composite rate change. Similarly an effect of the composite rate change on physician charges or other outpatient utilization was not observed for the waiver state patients. An exception is evidence that blood transfusions became more of an outpatient hospital service in 1984 in both waiver and PPS states.

When the effects in the waiver and PPS states for outpatient hospital clinics are compared, the data clearly suggest that the patients in PPS states had increased hospital clinic use (on an outpatient basis) but not so in the waiver states. In the PPS states, hospital clinic charges increased 50 percent (although on a fairly small base) measured by the 1984 time effect. The composite rate effect was negative 20 percent, which would suggest a net 30 percent overall increase between 1982 and 1984. Both the time and composite rate effects on hospital clinics were not statistically significant in the waiver states. These results further suggest that the PPS effect was to shift some cost from the inpatient to the outpatient sector.

Curiously, the number of dialysis treatments per DAR appears to be higher in 1984 by 7 percent for both waiver (Table 8) and PPS states (Table 9) compared to the 1982 level.[27] As reported in Tables 8 and 9 there were no statistically significant measured effects of composite rate changes on the number of dialysis treatments per time at risk i.e. those units that had larger cuts in Composite Rate were not more likely to increase dialysis treatments per week than were those units with smaller cuts in Composite Rate.[28]

A longer perspective, i.e. comparing more than just 1984 with 1982, of the measured treatments per DAR is shown in Figure 8. While there are some

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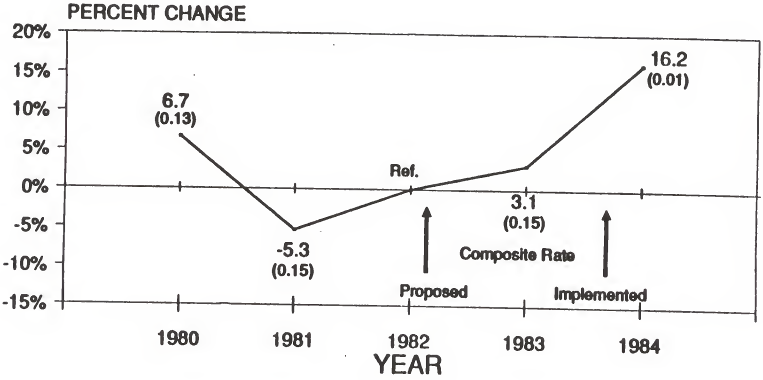
[27] While in general most patients receive three dialysis treatments a week, there is a distinct minority that receive two treatments per week. The estimated count of dialysis treatments per day at risk is estimated within a multiple linear regression based on a data set which includes all ESRD patients not just dialysis patients. Covariates control for patient therapy status. However a simple set of means and medians of dialysis treatments per day at risk for 1980 through 1984 restricted to in-center hemodialysis patients shows a similar increase for 1984. The means for 1980 through 1984 were as follows for PPS states: 0.29; 0.27; 0.29; 0.29; 0.32. The medians were: 0.33; 0.28; 0.32; 0.32; 0.35.

[28] It might be noted that the increase in CAPD patients over time could possibly lead to a rise in reported treatments in that their medical claims as reported to HCFA covered days and not treatments. In our analysis we converted these days to treatments at the rate of 3 treatments per 7 days. If this rate is above the average, which is most likely for all ESRD patients, then the increase in the number of CAPD patients over time could lead to an increase in the reported number of dialysis treatments over time. However, it is most unlikely that the CAPD increase could be large enough to account for the differences reported in Figure 8.

Changes in the Number of Dialysis Treatments per DAR, 1980-1984



* PPS States; 41 total covariates.
y = 0.283 trts/DAR
( ) is the p value.

FIGURE 8

reported variations about the reference period (1982), none were statistically significant with the exception of 1984. (In Figure 8, the p value for the hypothesis that the year estimate is different than the 1982 level is shown in parentheses).

The hospital stays for the PPS states appear to be up in 1984 compared to the 1982 level. It should be noted that this result is with other covariates held equal. The effect of the composite rate change in this regard is not statistically significant for inpatient utilization.

This finding of increased hospital stays in the PPS states is so at variance with the conventional wisdom regarding the impact of the PPS system, that this result was further examined. As discussed in the cautions above, we had concern that perhaps 1982 was a peculiarly low year for hospitalization and that 1984 was more normal. Tests of the 1980 to 1984 period did not confirm this alternative hypothesis i.e. the number of hospitalizations per DAR did not differ statistically between 1980 and 1984 except that 1984 was higher. In other words the rate for 1982, which was the base year used in the analysis above, was not found to be different than 1980 to 1983 period but it was statistically different than 1984. However, given the cautions listed above and the conventional wisdom regarding the effect of PPS on inpatient stays, conclusions on PPS impact on hospitalization should be left open for further analysis.

Similar tests for hospital days did not reject the null hypothesis that all years were the same. This suggests that the increased hospital days reported above may not be different statistically for 1984 compared to 1982 when a longer time trend is considered i.e. comparing 1980 through 1984 versus 1982 with 1984 only.

(c) Conclusions about Changes in Spending. The data and the estimates just presented cover a number of issues. It is not easy to generalize these results, but it would be useful to focus on two particular estimates: the 1984 time effect (comparing 1984 with 1982) and the effect of the composite rate change.

While the patients in the PPS states show increased inpatient stays, it does not appear to be attributable to the composite rate change. If it were associated with the composite rate change, it should have been seen in the waiver states as well. This was not the case. Furthermore, the estimate is statistically significant in only the time effect i.e. there is not a statistically significant effect when comparing patients whose dialysis provider had a large composite rate change with patients whose provider had a small composite rate change. The result of these observations is to suggest that the composite rate change is not associated with greater patient morbidity as measured by in-hospital stays, at least in the short run of the first year following implementation.

The number of dialysis treatments per DAR appears to have increased in 1984 compared to 1982. Whether this a random change cannot be (definitively) decided by this current research. The rise in 1984 is particularly large. But it may be a consequence of better data collection. In any case, the change in composite rate was not correlated with this increase in dialysis treatments per patient although the increase was observed in both the PPS and waiver states.

(1) Net Outpatient Savings Due to Composite Rate. [29] The net savings in outpatient charges between 1982 and 1984 was 5.6 percent averaged over PPS and waiver states. This estimate is based on a linear regression which controls for patient and provider characteristics. This adjustment would, for example take into account the increased numbers of diabetics between 1982 and 1984 who are on average more expensive to treat.

This 5.6 percent reduction in the overall outpatient charges compares with the reduction in the composite rate of 10 percent (See Table 5 above). To the extent that waiver state effects more nearly reflect the true composite rate impact, it would suggest that there were some but not dramatic offsetting effects by, for example, more dialysis treatments per patient.

To sum up, the net effect of the 10 percent reduction in the Composite Rate in 1983 led to a 5.6 percent reduction in outpatient charges per patient. The government did not see this reduction directly since the number of dialysis patients increased between 1982 and 1984. Assuming that this increase in the number of patients did not result from the Composite Rate change of 1983, it is fair to say that there were savings of the order of 5.6 percent in outpatient charges compared to what would have been the case if the government had not implemented Composite Rate. This savings is shown in Figure 8A.

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[29] This estimate of savings in the outpatient approved charges is the weighted average across PPS and Waiver states. The estimates for each of these two subpopulations was derived within a multiple linear regression which estimated a time effect (1982 to 1984) and a Composite Rate effect plus other covariates. The composite rate effect was based on a 10 percent decrease in the the rate for outpatient dialysis. While the estimated change in outpatient charges is based on a data set which includes dialysis as well as transplant patients, a covariate allows for non-dialysis patients. In extrapolation to the dollar amounts, only the number of dialysis patients in 1982 and 1984 is considered. It is assumed that the number of dialysis patients is not affected by the Composite Rate. The estimate of the number of dialysis patients is the end of year census which is lower than the total number of patients who were eligible at any time during the year by approximately 20 percent. While this would affect the estimate of total savings it would not affect the percentage estimate presented.

2. How Were Savings Achieved at the Level of Delivery?

How these apparent savings to HCFA were achieved at the level of care, however, seems less clear. Conceptually, one may reason as follows. An industry obliged to provide basically the same service for less money must adjust in one of six ways: First, savings may come from a reduction in net revenues (or profits) received by the dialysis unit's owners. Second savings may come from wage cuts for employees of units. Third, patients might shift from higher-cost units to lower-cost units, with the former presumably forced out of business altogether. (There are considerable economies of scale in the industry, so smaller units can be hard pressed.) Fourth, each unit in the industry could provide care more efficiently, thus making do with a lower payment level. Fifth, units may cut quality to patients, through changes in the service provided (or, similarly, cut access differentially by refusing to care for more expensive patients). Sixth, units may receive a subsidy from some other organization such as a parent hospital.

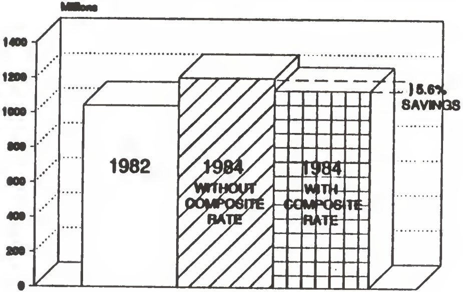
These categories may seem conceptually neat and distinct, but in practice they are hard to distinguish from one another and very difficult to illuminate empirically. We continue here with a rather hypothetical qualitative discussion and then turn to some empirical evidence on quality and other attributes of service that seem relevant to these issues.

Qualitatively, a number of remarks seem in order:

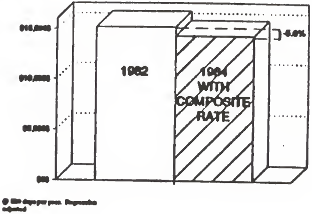
Profits and Wages. There seems to be no empirical evidence on the extent to which profits or wages have been reduced, if at all. There is theoretical reason for concern that in some markets, a lower payment rate cannot eliminate unduly high payments to owners, physicians and employees because there is no

Outpatient Approved Charges, Dialysis Patients, 1982-1984

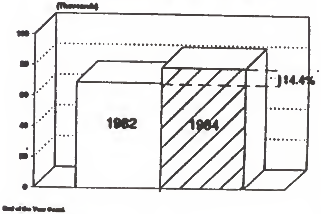
Total Outpatient Approved Charges



Outpatient Dollars per Patient-Year



Number of Dialysis Patients



All charges exclude physician
Savings are regression adjusted.

FIGURE 8 A

effective competition. Where planning rules inhibit entry of new units or expansion of existing units, patients have nowhere to move if their unit chooses to reduce quality rather than profits or wages. Elsewhere, there is anecdotal evidence that profit margins are down.[30]

Success of Efficient Units. There do not appear to have been great shifts among units of patients--from presumably inefficient units to more efficient ones. (Patients have nothing to gain financially by changing units, and only physician incentives or a closure of their current unit would seem apt to prompt this sort of move.) No large-scale movement of patients within the industry seems to have occurred, although there have been anecdotal accounts of formerly hospital-based units opening as independent stand alone units so as to reduce their overhead. From the overall perspective of society this would not represent a real source of savings but from the perspective of the individual unit such a move might represent a real method to make ends meet. A further investigation of this possibility is warranted.

Greater Efficiency at Each Unit. Differentiating increased efficiency from decreased quality calls for a definition of necessary "quality" as opposed to unnecessary or low-value "fat" or "waste." Such judgments are notoriously difficult in health care. One type of efficiency that policymakers had expected was a switch of many patients from in-facility to home care. Through 1985, at least, no such switch had materialized. In retrospect, there are good reasons to believe that, adjusted for casemix and other concerns, the difference in cost between home care and unit care was very slight most likely less than 5 percent. (see attachment).

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[30] According to economic theory, if dialysis markets and labor markets are competitive, cutting profits or wages will reduce the supply of dialysis (or change its attributes) and of labor. Only if "excess profits" or "rents" exist can cuts occur without changes in other aspects of delivery.

It is possible that some changes were occurring simultaneously which would have contributed to increased efficiently. For example the removal of Certificate of Need requirements at approximately the same time as the composite rate reductions would more than likely lead to greater efficiency. CON probably prevented units from achieving an efficient mix of capital and labor. (See Held and Pauly, 1983). Similarly possible other technical changes such as shortening of the length of dialysis could contribute to increased efficiency.

As discussed below with the exception of the for-profit freestanding units there has been reasonable growth in the average dialysis unit size. This means that there were likely to have been some increased economies of scale as a consequence.

Product Change/Quality of Care. Changes are said to be occurring in the way that dialysis is provided, although it is undocumented precisely the extent to which this is due to the composite rate as opposed to other economic, medical, technical or social trends. One hears that staff-to-patient ratios have dropped, that technicians have been substituted for registered nurses and the like, and that the average time per dialysis treatment has also dropped, and that reuse of dialyzers and accompanying blood lines has increased. Our empirical evidence suggests the first and last of these points (see next subsection) but data are lacking on most attributes of care that might show "corner-cutting."

D. Quality of Care

1. Mortality changes.

While additional analyses are needed, a number of analyses of 90 day and one year mortality have been conducted. The results so far suggest two major points:

- Given sex, race, and diagnosis, there appears to be a general rise over time in both 90 day and one year reported mortality for new ESRD patients. This change is most likely centered on the elderly which have shown substantial growth in new patients in recent years. Whether this increase is only recent is not clear. For example in the 1985 PPS report to Congress (Office of Secretary, HHS, 1986) this trend was identified and reported as being a consequence of more severe patient selection among the elderly. This report indicated that the increase occurred after 1983. Our preliminary work generally agrees in that there has been an increase in mortality for the elderly. However, it is not clear, from our preliminary work, whether the increase in mortality may have started before 1980.
- Evidence of a correlation between changes in mortality and the extent of composite rate changes was not found, i.e., mortality did not rise more where the composite rate changes were larger.

These mortality changes need further analyses and may reflect the general wisdom that changing ESRD patient selection criteria are resulting in a sicker cohort for treatment. This is consistent with the increased numbers of diabetics, for example, in the ESRD population.

While these efforts have focused on the survival of the new cohorts, a useful addition would be to examine the mortality of the established patient as distinct from the new cohorts. Finally, it should be emphasized that these analyses so far, have focused on the short run primarily because the payment policy changes have only occurred recently. In the future, there will be continuing need to consider the longer run possibilities which if there are real changes in quality, they may only be seen as a consequence of more long term insidious changes in quality of care.

Morbidity Changes. As shown above, increased hospitalizations in the PPS states can be interpreted as a sign of increased morbidity, but there was no evidence that the increase was linked to the extent of composite rate changes. In waiver states, moreover, there was no increase in hospital stays or days between 1982 and 1984, despite the composite rate cuts there. Hospitalization changes if found to be real in the PPS states (see Caution 3 above) are likely to reflect PPS changes rather than composite rate changes or changes in morbidity.

2. With respect to Reuse

Many patients, providers, and observers of the ESRD program and nephrology in general are concerned that reuse of dialyzers or lines is less safe or effective than first use (a new dialyzer each time)—especially if proper standards of cleaning and storage for reuse are not met.[31] On the other hand, many are convinced that reuse is both safe and effective. It has certainly been practiced in many units for many years, and there is a scientific rationale for expecting that the biocompatibility of a dialyzer increases with reuse, thus also avoiding "first use syndrome."[32]

(a) Overall Growth in Reuse. At year's end 1980, the level of reuse was 30 to 36 percent (of units) among the free standings (both for-profit and not-for-profit), although it remained very low among hospital units. These percentages climbed rapidly thereafter, most rapidly by year's end 1982 — almost a year after composite rate was announced but before it was effective. (Data are unfortunately not available for 1981.) See Figure 9.

(b) Relevance of Profit Status. Does this rapid shift reflect the composite rate, some extra desire of for-profits to economize, simple technological diffusion and clinical acceptance, or some combination of these and other factors?

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[31] The literature of concern is voluminous. It is sufficient to note the Congressional hearings held in 1986 on the second round of composite-rate cuts.

[32] See the hearings just cited. The first national epidemiological study found survival just as good long-term reuse (Held et al., 1987), reproduced as an attachment.

Percentage of Units Reusing Dialyzers by Type of Unit, 1980-1985

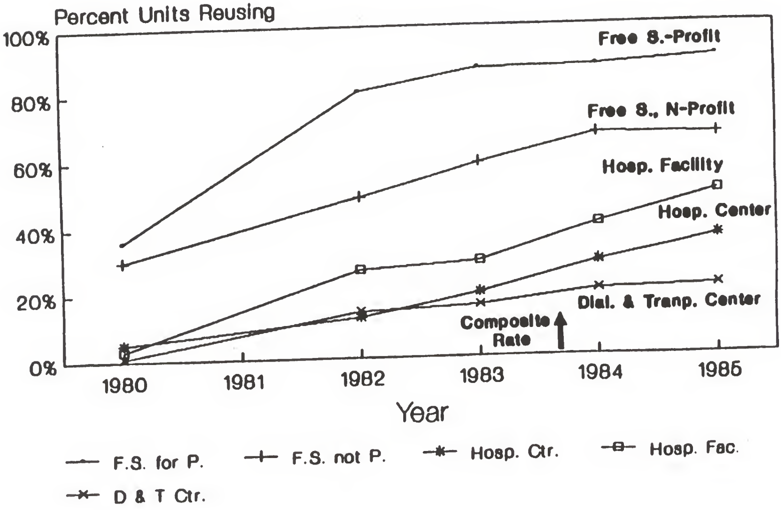

FIGURE 9

More analysis is needed to answer this question with confidence, but some discussion is already possible. Some observers would attribute the differential levels of reuse to the differential influence of profit-seeking motivation—the least in the hospital centers (that do inpatient and outpatient care), next least in the hospital-based outpatient units, more in free-standing units run on a not-for-profit basis, and most in the for-profit free standings. It is notable that the relative positions of each of these groups has remained little changed over time, although the free-standing for-profits clearly had the biggest 1980-82 jump in reuse. Alternatively, one can hypothesize that the change reflects respective institutional and professional resistance to technical change. Some hypothesis tests regarding changes in reuse policy and composite rate changes are reported in Tables 11 and 12. In Table 11, only units which were not reusing dialysis in 1982 are presented by whether they were reusing in 1985. This is the reason for the term "longitudinal analysis." The results shown in Table 11 suggest that, even though the for-profit free-standings had the highest percentage (80.3) reusing in 1982 (Table 10), they also had the largest increase between 1982 and 1985. With the exception of the Transplant Units, the data of Table 11 show that the other three types of units were nearly equal in their switch to reuse between 1982 and 1985.

More detailed hypothesis tests, also using a longitudinal approach, are shown in Table 12. There is no support for the hypothesis that units that had larger composite rate reductions were more likely to switch to reuse than were units that had smaller composite rate reductions. (The null hypothesis of no effect cannot be rejected. This is indicated by the high P values in Table 12.) Similar tests of a statistical association between type of unit and changes in reuse policy are also shown in Table 12. In the 1980-1985 period the free-standing units, both profit and not-for-profit, were more likely to switch to reuse of dialysis than were other types of units.

Table 10

Percentage of Units Reusing Dialyzers, by Type of Unit, 1980-1985[a]

Type of ESRD Unit[b]		Reusing Dialyzers					
		1980	1982	1983	1984	1985	1985/1980
Freestanding:							
For-Profit	%	35.8	80.3	87.0	87.4	89.8	2.51
	Total n	310	370	452	499	482	1.56
Not-for-Profit	%	29.9	48.5	58.5	66.9	66.4	2.22
	Total n	77	101	123	130	119	1.54
Hospital Center	%	4.9	12.3	19.4	28.5	35.8	7.31
	Total n	265	276	284	288	282	1.06
Hospital Facility	%	2.8	26.7	29.0	40.0	49.4	10.08
	Total n	71	75	76	90	81	1.14
Dialysis and Transplant	%	0.8	13.9	15.6	19.8	20.9	26.1
	Total n	120	115	109	111	110	0.92
Transplant Center	%	11.1	33.3	50.0	0	0	-
	n	9	9	2	2	2	
Total[c]	%	18.0	44.4	51.5	57.6	61.1	3.39
	n	1,000	937	1,124	1,211	1,262	1.26

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a. Data are from the National Center for Disease Control and the Health Care Financing Administration (HCFA).

b. According to the 1984 HCFA Master Provider File.

c. Includes some observations for whom type is not known. Count of providers varies from total respondents because of some non-response to this question. In most years the difference was less than 20. In 1982 it was 81.

Table 11

Units Which Switched from No Reuse to Reuse of Dialyzers, 1982-1985, by Type[a]

(Longitudinal Analysis)

	Not Reusing in 1982	
Type of ESRD Unit[b]	Total Census[c]	Reusing 1985
Freestanding:		
For-Profit	65	64.6%
Not-for-Profit	42	31.0
Hospital Center	218	29.4
Hospital Facility	46	28.3
Transplant; Dialysis and Transplant	80	10.0
Total	451	31.0

a. Data are from the Centers for Disease Control and the Health Care Financing Administration.
b. As recorded by HCFA 1984.
c. CDC reuse data are a practical census.

Table 12

Hypothesis Tests of the Change in Composite Rate and Change in Selected Measures for ESRD Units[a]

(Longitudinal Analysis)

Measure To Be Explained	Mean Change	Statistical Association: Change in Composite Rate	Statistical Association: Type of Unit[f]	Sample/Census Count
Change in Reuse Policy[c] (1980-1985)	52%	No (P>0.86)	Yes; FPFS, NFPFS (P<0.01)	620
Change in Reuse Policy[d] (1982-1985)	35%	No (P>0.89)	Yes; FPFS (P<0.01)	396
Change in Patients Per Staff (1983-1985)[e]	6%	No (P>0.40)	No (P>0.66)	797

a. Reuse policy and patients per staff are from the CDC.
b. Regression with type of unit covariates.
c. No in 1980; yes in 1984 or 1985.
d. No in 1982; yes in 1984 or 1985.
e. Patients/staff; (1985)-(1983).
f. Compared to hospital center (reference group) FPFS is for-profit free standing; NFPFS is not-for-profit free standing.

(c) Effects on clinical quality. Although we lack clinical data from before and after the composite rate, some broad-based data containing some cross-sectional variation do exist from the SODI-related national sample already discussed. Future work will compare reusers with nonreusers, controlling for the extent of composite rate change they faced and for other factors. Indicators pulled from patients' medical records include weight gain between dialysis sessions, blood chemistries, and certain intra-dialytic events such as nausea and hypotension.

Another type of quality measure—broadly conceived—is patient satisfaction with their care and other aspects of their life, proportion working, and similar patient-survey measures. Unfortunately, comparable data from before and after composite rate do not exist. We do have one post-CR data set to analyze on a cross-sectional basis for association of attitudinal differences with payment rate differences.

(d) Effects on morbidity and mortality. As referenced above, one study of patient survival found reusing units' patient survival just as good as nonreusers. In general, the research on dialyzers has not shown adverse effects of reuse. More work remains to be done.

Long-term survival may be the key concern, especially given fears of cancer from potential exposure to formaldehyde (the usual cleansing agent for reuse). Even if survival rates seem equivalent, there remain concerns about whether certain subpopulations might do better by not reusing than by reusing. (It appears that most decisions to reuse are made at the unit level for all patients, not individualized by patient.)[33] Moreover, even if aggregate experience is adequate on reuse, individual units might not be doing as well for failure to meet accepted quality standards, such as those of the Association for the Advancement of Medical Instrumentation. Finally, it may be that the causes of death will be shifted, which may or may not have policy implications.

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[33] Common wisdom is that when a unit decides to reuse nearly all patients in the unit reuse. In fact, there isn't a lot known about the true state of how many patients in reuse units don't reuse.

In the shorter run, one needs to be concerned about infections, which may often require hospitalization, the extent of hospitalization needed in the different populations, acute intra-dialytic events (such as nausea or hypotension), and patient satisfaction.

3. Changes in the Patient-to-Staff Ratio

Some concerns have been expressed about units' changes in staffing levels under fiscal pressure. This is an important subject for patients; of those patients surveyed nationally who were dissatisfied (a minority), by far the most listed the need for more and better trained staff at their units as their main complaint (see Held and Bovbjerg 1987, attached). An effort was therefore made to assess trends in staffing before and after composite rate. The results are shown in Table 13 and graphed in Figure 10.

Unfortunately, no consistent time series of data is available for the period of interest. The data presented come from a year-end survey by the Centers for disease Control (CDC), and the wording on the staffing question was changed precisely at the crucial time for this analysis—year's end, 1983, a few months after the composite rate changes were implemented in August.[34]

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[34] Essentially, the wording through calendar 1982 requested information on total staff at units and on staff with direct patient contact, specifically excluding clerks but also not counting dieticians and social workers, who are less obvious exclusions. In 1983 and thereafter, units were simply asked to give the number of staff with direct patient contact, without a specific definition, thus leaving each unit's reporter to determine whom to cover (and may have included dieticians and social workers when given discretion). Given the lapse of time since this change and the lack of a follow-up question on definitions, one cannot be sure how the change affected reporting. (Casual inspection of Table 13 suggests that 1983 reporting did count more staffers as in direct patient contact than did 1982—because the ratios are down across all categories

(Footnote 34 Continued on Next Page

Table 13

ESRD Patients Per Staff, by Type of Unit, 1980-1985[a]

Type of ESRD Unit[b]	1980	1982		1983/82[c]	1983	1984	1985	1983/85[c]
Freestanding			WORDING CHG.					
For-Profit	3.83	3.94		0.97	3.64	3.75	3.70	0.98
Not-for-Profit	3.03	3.31		0.92	3.06	3.34	3.26	0.94
Hospital Center	2.41	2.56		0.94	2.45	2.61	2.63	0.93
Hospital Facility	2.59	2.85		0.91	2.52	2.78	2.90	0.87
Dialysis and Transplant Center	1.80	1.96		0.92	2.03	2.06	2.10	0.97
Transplant Center[d]	2.07	2.35		0.88	3.12	2.23	2.68	1.16
Total	2.83	3.06		0.92	2.94	3.11	3.09	0.95

a. Data are from the National Centers for Disease Control and from the Health Care Financing Administration. Estimates are based on the patients treated and staff employed in the last full week of the year. Employees are total count, i.e., are not full-time equivalents. In 1983-1985 the CDC questionnaire changed. The new questionnaire asked how many full- or part-time staff had direct contact with patients or equipment. A calculation is used with earlier data (1980, 1982) in order to achieve a similar comparison. (The no. of employees who did not have direct patient contact is subtracted from the total no. of facility staff.) Note that the changes in wording which occurred in 1983-1985 may still affect the data reported, i.e., the comparisons over the 1982-83 period are questionable.

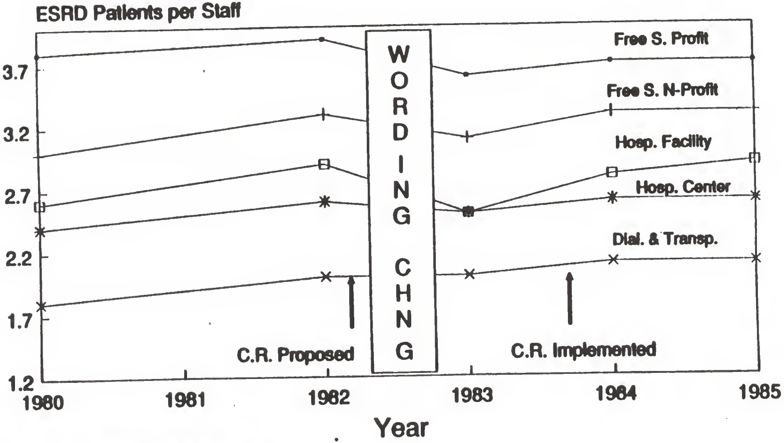
b. Based on HCFA classification by Master Provider Record in 1984.

c. Data for these years are collected using the same questionnaire format.

d. Few observations, varies from 2 to 9 ESRD units.

ESRD Patients Per Staff

by Unit Type, 1980-1985



Data from CDC. Estimates based on pats. treated/staff employed in last full week of year. No data was collected in 1981.

FIGURE 10

The data are the average numbers of ESRD patients per staff, by type of unit (for-profit freestanding and several others). Both before and after the composite rate, the general trend was up—that is, a decrease in staff support for patients. But the changes were not large, about ten percent, more or less, over two years in each case. And there is no way to relate changes to composite rate through before-and-after comparisons; the discontinuity in the data between 1982 and 1983 is indicated by the break in the graph lines in Figure 10.

In 1980, the highest patient-staff ratios were in the for-profit freestandings, but they increased least by 1982—from 3.8 patients per staffer to 3.9. On the face of it, this is curious, because these units were under the greatest pressure to economize, given their fixed level of payment. Other types of units had faster rises; again, this calls for explanation, since many hospital units, for example, had exceptions to the national payment ceiling and hence would seem to have been less pressured to reduce staff. In any case, the relative rank order of units remained the same in 1982 as it had been in 1980.

During the post-composite-rate period of 1983-85, the overall trend was again moderately up, meaning slightly reduced staffing as perceived by many patients. The average rise, post composite rate, seems roughly comparable to the "pre" period, on the order of ten percent—more for some categories of units (e.g., hospital facilities) and less for others (e.g., for profits).[35]

(Footnote 34 Continued from Previous Page)
of units, as discussed in the next footnote.) As a result of this discontinuity in reporting, the analysis in the text considers 1980-82 and 1983-85 as separate reporting eras.

[35] It is notable that the "change" between 1982 and 1983 goes in the opposite direction—down from 3.1 to 2.9, on average. An increase in staffing per patient is certainly counterintuitive at a time when payment rates were cut, markedly so for hospital units that had previously had

(Footnote 35 Continued on Next Page

Again, the for-profit freestandings topped the list in both years, with the others in the same order behind them; but by 1985, the rest of the industry had moved relatively closer to the for-profits' ratios.[36]

Even though analysis cannot reliably compare before and after composite rate, it is possible to do cross-sectional analysis (across units) during the the post 1982 period. The basic approach here is to examine units that had different levels of composite rate change to determine if staffing changes correlate with composite rate changes. (See table 12 which also reports similar analyses for changes in reuse policy versus composite rate changes.) The results of a similar cross-sectional analysis for staffing versus composite rate are that one cannot reject the null hypothesis of no correlation between the two.

As explained in more detail in an appendix, the patient to staff data derive from the CDC survey which is primarily focused on the issue of communicative diseases. As a consequence, the data do not count employees of a unit which are not located in the dialysis unit. To the extent that particular types of units may have more or less off site employees, the data are less reliable for comparison across the various types of units. Systematic differences in the size of units by type would also affect the accuracy of these data for across type comparisons, since there are known economies of scale in dialysis which are most likely to be present in staffing patterns. It is expected that these types of biases may be less of a problem when performing comparisons by unit type, over time, as was done above.

(Footnote 35 Continued from Previous Page)
exceptions; this supports the hypothesis that units' reporting definitions did indeed change in 1983 compared with 1982.

[36] ESRD units differ in size by type of unit, raising the possibility that differences in staffing ratios might reflect economies of scale. Accordingly, alternative tests that accounted for size differences were also used. Overall, the basic results were not changed.

4. Effects on Transplants

Some previous research has suggested that patients treated with reused dialyzers will either be less likely to obtain a kidney transplant or will have less success with a transplant than will comparable patients treated with new dialyzers. Given the CDC and SODI data on reuse and the long-term survival information in the HCFA data base, we expect to be able to address this issue shortly, using methodology already used with success for other survival analyses.

The analyses will be of two types. First, are patients of units that reuse more or less likely to receive a transplant, given other patient covariates? This issue will be addressed by probit analysis for a yes-no comparison of who does and who does not obtain a kidney transplant. The issue will also be addressed by a Cox-type analysis where the dependent variable is the days from first dialysis to a transplant. It would be desirable to conduct similar tests for length of time on a kidney dialysis transplant waiting list; data limitations may preclude such an approach.

The second form of analysis will be a Cox proportional hazards analysis for patient mortality and graft survival (both measured in days) wherein the covariates will include whether the patient was treated with reused dialyzers and possibly also the length of time the patient was receiving such treatments.

E. Effects on the Dialysis Industry

In one sense, the composition of the industry is the obverse of the changes-in-access issues that were addressed at the beginning of this section. Recall Figure 2's demonstration that distribution of patients across dialysis units seemed little if at all affected over the period of all these payment changes. This shows that the industry structure has not changed much of late, although units have grown somewhat in size (Figure 3).

Table 14 below gives a slightly different presentation. As can be seen, free-standing units have grown from 1980-1985 in their aggregate market share at the expense of hospital-related units. This may continue longer-term trends; at the outset of the Medicare program, few non-hospital units existed, whereas now they dominate the industry.

Considerably more work in this area is desirable. A major issue is what if any effect composite rate and other payment changes have had on profit margins (including those of not-for-profit units, known as net revenues).[37]

IV. SUMMARY AND CONCLUSIONS

See the Executive Summary at the beginning of this report.

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[37] Prior research in the pre-composite-rate era has found that the profit margins of not-for-profit dialysis units were higher than those of explicitly for-profit ones. (Held and Pauly, 1983, attachment 4 hereto.)

Table 14

Mean Patients Per Unit and Percentage of Total Patients, by Type of Unit, 1980 and 1985[a]

ESRD Unit Type	1980		1985	
	Mean Patients	% Total Patients	Mean Patients	% Total Patients
Freestanding				
For-Profit	57	45	59	49
Not-for-Profit	57	11	64	13
Hospital Center	38	26	49	24
Hospital Facility	26	5	33	5
Dialysis and Transplant Center	41	12	47	9
Transplant Center[b]	63	1	34	<1
Total[b]	46	100	54	100

a. CDC data. Incenter patients.
b. Includes Unknown unit type.

Average ESRD Unit Size,
1980-1985

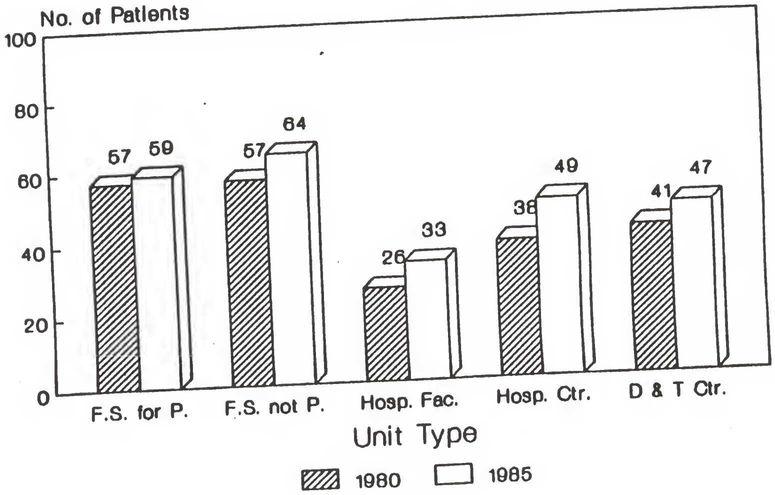
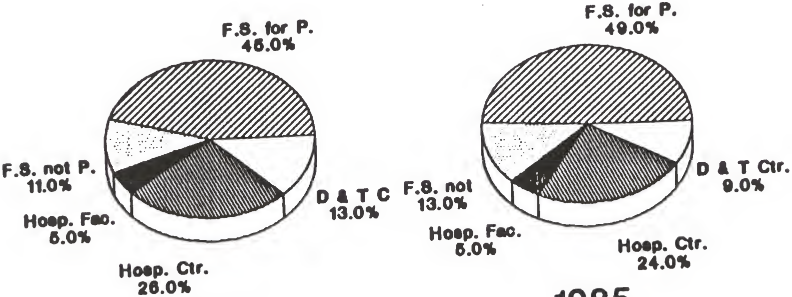


FIGURE 11

Distribution of ESRD Patients
by Type of Unit, 1980 & 1985



1980

1985

FIGURE 12

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Appendices

A. Methods to Economize in ESRD Units

B. Changes in Morbidity and Costs

C. Changes in Access for ESRD Patients and Services 1982-1985

D. Estimating the Change in the Medicare Approved Charge for Outpatient Dialysis 1982-1984

APPENDIX A

METHODS TO ECONOMIZE IN ESRD UNITS

METHODS TO ECONOMIZE IN ESRD UNITS

INTRODUCTION

Changes in the payment for outpatient dialysis in 1983 put additional pressure on ESRD dialysis units to find ways to economize on the methods of delivering services. This paper will focus on two methods that a unit can use to reduce the cost: reduction of dialysis personnel and the reuse of dialyzers. Not too differently than the rest of American society, the cost of labor is the largest part of the cost of producing dialysis services. Supply costs are also large and dialyzers are a large part of those costs. We will develop basic statistics which bear on these issues and test some hypotheses related to the changes in payment policy.

The basic focus is on the 1982-1984 period but the years preceding and following are also considered. These added years are considered because it is desirable to distinguish trends over time which may be occurring for quite separate reasons from changes which are specifically related to the policy changes of interest. In the current issue it may not be totally possible to separate these effects but the reader will at least be given a wider picture than would be the case if the focus was kept quite narrow.

METHODS

The methods are quite straightforward. ESRD dialysis units are compared over time for their policy regarding the reuse of dialyzers and their patient to staff ratio. Reuse policy is considered one of two choices: the unit reuses dialyzers or it does not. The question is asked by CDC at the end of the year but the question refers to whether the unit reused dialyzers at all during the preceding year.

The patient to staff ratio for a specific unit is the ratio of total patients dialyzed in the last week of the year to the total staff employed also in the last week of the year. Dialysis units are categorized by their type (e.g. freestanding, sometimes called independent, hospital center which is authorized to perform all kidney related services except transplant, hospital facility which can only perform outpatient dialysis) and for-profit status as classified by HCFA in 1984. (A future revision of this topic should consider changes in the status of the unit over time).

Besides basic tabulations, additional analyses focused on hypothesis tests of the change in these two fundamental indicators and the change in the composite rate price, i.e. the change between 1982 and August 1983 in the approved (by HCFA) price for outpatient dialysis. The method of analysis was multiple linear regression which included covariates for type of unit and, for reasons which relate to the estimation of the 1982 price, whether the unit was on the initial or alternate method for compensation of physicians for supervision of maintenance dialysis. The estimation of the standard error for the ratio of the mean statistic patients per staff used an approximation described by Cochran, 1963.

DATA

The data on policy regarding reuse of dialyzers are from the annual surveys of ESRD dialysis units[1] conducted by the National Center for Disease Control (CDC). The data used in this analysis come from the 1980, 82, 83, 84, and 85 surveys. Since these surveys are focused on transmission of communicable disease such as hepatitis, the survey questions regarding patients and personnel tend to deal with personnel in the unit and not staff which may be at a distance. For example, units which may be part of a chain may have staff that perform functions at a distance which for smaller non-chain units may be performed on the site. Consequently the staffing questions may not be totally comparable across type of unit. In addition the questions did not distinguish by type of personnel in the unit such as registered nurse and technician or social worker. The count of personnel is a "head count" and is not on a full time equivalent basis. As discussed by Held et. al., the CDC data appear to be reasonably full count of all ESRD units with patients. The CDC count of patients focus on in-center patients. Consequently home patients and CAPD patients would not be included in these CDC counts.

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[1] Free standing, hospital facilities, hospital units, dialysis and transplant centers. There is a slight underreporting transplant centers.

ESRD units were classified by type and ownership status with the data from the HCFA files in 1984. The for-profit units are distinguished for only the free-standing units, i.e. the profit status of the hospital units was not considered since the number of for-profit hospital units was small in 1984.

RESULTS

The Choice to Reuse Dialyzers

The basic statistics regarding the practice of reusing dialyzers and changes in this policy is presented in Table 1, and Figure 1. Starting in 1980 few units were reusing dialyzers, substantially under 30 percent. In addition, freestanding units did not differ much in profit status in 1980 by whether or not they reused dialyzers. In subsequent years there was a general increase in the policy of reusing dialyzers, especially for the free standing units. But even among these units it was the for-profit units which had the largest growth most of which occurred before 1982, a year before the change in the payment rate for dialysis. By 1985, 90 percent of the for-profit units were reusing and 66 percent of the not-for-profit freestanding units were doing so. Hospital facilities, which are closest to the freestanding units in focus, were also closest to the freestanding in terms of the reuse of dialyzers. By 1985, 49 percent of the hospital facilities were reusing. The least likely units to reuse were the dialysis and transplant centers. By 1985 only 21 percent of these units were reusing.

The results of other tests regarding the reuse of dialyzers are presented in Tables 2 and 3. In Table 2 a longitudinal approach is taken in that the focus is on units which were not reusing in 1982. The data presented show what percent of these units had switched to reuse by 1985, by type of unit. Even though a large percent of the freestanding profit units were already reusing in 1982, a larger percent of these units were more likely to switch to reuse than were the other types of units. A similar approach, but using 1980 as the base year is presented in Table 3. In 1980 the units were more alike regarding reuse at this time.

The results of tests of statistical association between the change in price and the change in policy regarding reuse is also presented in Table 3. As indicated by the p value the null hypothesis of no relationship between the change in dialysis price and the change to reuse of dialyzers cannot be rejected. In other words these data do not support the notion that units which had larger reductions in the price of dialysis were more likely to switch to a policy of reusing dialyzers.

Patient to Staff Ratios

The in-center patient to staff ratio for the 1980 to 1985 period by type of unit is presented in Table 4 and Figure 2. By type of unit, the for-profit freestanding unit had the highest patient to staff ratio, 2.7 in 1980. The lowest ratio was for the dialysis and transplant centers which had a ratio of 1.5 in 1980.

Overall the patients to staff ratio increased by 30 percent between 1980 and 1985 for all types of units. With the exception of the hospital facilities nearly all of this increase occurred between 1982 and 1983. As can be seen most clearly by data in Figure 2 there was a similar percentage increase for all types of units in this same time period.

Results of hypothesis tests of the relationship between increases in the patient to staff ratio and changes in the payment rate for maintenance dialysis are shown in Table 3. As in the previous case the analysis is longitudinal in that the analysis is focused on 754 units that were in the file in 1982 and 1985. The measure to be explained is the change in the patient to staff ratio. The results suggest that the null hypothesis of no relationship cannot be rejected, i.e. these data for the 1982-1985 period do not support the notion that units where the rate cut was larger were more likely to increase the patient staff ratio than were units for which the reduced payment was smaller in magnitude.

Discussion

It is clear that two of the changes in the management of dialysis units which can lead to less costly treatments, i.e. the reuse of dialyzers and the patient to staff ratio, have increased significantly over time. The evidence of whether they were directly attributable to the decreased price paid for outpatient dialysis is less clear. The policy to reuse dialyzers saw the major increases in the pre-1982 period long before the reduced price became a reality. While the major increases occurred in the pre-1982 period there have been continuous increases for the 1980-1985 period in the policy, especially for the non-profit units. The data presented however did not support a causal link between the price change of 1983 and the decision to reuse dialyzers. The sample of units was quite large and in fact begins to represent a census. This makes the statistical precision even more reassuring.

It can be argued that the world is not as linear as the statistical tests presume. Perhaps it is the case that the price change for dialysis was just one of the many changes in the environment for dialysis and one cannot separate all the effects out. This argument would say that there was knowledge of pending cuts for some years and the decisions were made in anticipation of the reductions. In addition, it might be argued that the crossectional variation was just not large enough to give the indications posted by the hypothesis test.

The results for changes in patients per staff are more clear. The increase was uniform for all types of units and roughly coincided with the decreased payment rate. Again the crossectional tests did not support the causal link between the reduced price and the increased patients per staff ratio. The coincidence with 1983 and the consistency across all units is most remarkable. One would like to suppose that the 1982 changes are supportive of the causal model but the changes are so uniform for all types of unit that future analysis should consider verification of this remarkable change. Also, another form of data fitting should be considered such as probit which would be more appropriate for the binary nature of the yes no to reuse question.

Table 1

Percentage of Units Reusing Dialyzers, by Type of Unit, 1980-1985[a]

Type of ESRD Unit[b]		Reusing Dialyzers					1985/1980
		1980	1982	1983	1984	1985	
Freestanding:							
For-Profit	%	35.8	80.3	87.0	87.4	89.8	2.51
Total	n	310	370	452	499	482	1.56
Not-for-Profit	%	29.9	48.5	58.5	66.9	66.4	2.22
Total	n	77	101	123	130	119	1.54
Hospital Center	%	4.9	12.3	19.4	28.5	35.8	7.31
Total	n	265	276	284	288	282	1.06
Hospital Facility	%	2.8	26.7	29.0	40.0	49.4	10.08
Total	n	71	75	76	90	81	1.14
Dialysis and Transplant	%	0.8	13.9	15.6	19.8	20.9	26.1
Total	n	120	115	109	111	110	0.92
Transplant Center	%	11.1	33.3	50.0	0	0	-
	n	9	9	2	2	2	
Total[c]	%	18.0	44.4	51.5	57.6	61.1	3.39
	n	1,000	937	1,124	1,211	1,262	1.26

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a. Data are from the National Center for Disease Control and the Health Care Financing Administration (HCFA).

b. According to the 1984 HCFA Master Provider File.

c. Includes some observations for whom type is not known. Count of providers varies from total respondents because of some non-response to this question. In most years the difference was less than 20. In 1982 it was 81.

Table 2

Units Which Switched from No Reuse to Reuse of Dialyzers, 1982-1985, by Type[a] (Longitudinal Analysis)

	Not Reusing in 1982	
Type of ESRD Unit[b]	Total Census[c]	Reusing 1985
Freestanding:		
For-Profit	65	64.6%
Not-for-Profit	42	31.0
Hospital Center	218	29.4
Hospital Facility	46	28.3
Transplant; Dialysis and Transplant	80	10.0
Total	451	31.0

a. Data are from the Centers for Disease Control and the Health Care Financing Administration.
b. As recorded by HCFA 1984.
c. CDC reuse data are a practical census.

Percentage of Units Reusing Dialyzers by Type of Unit, 1980-1985

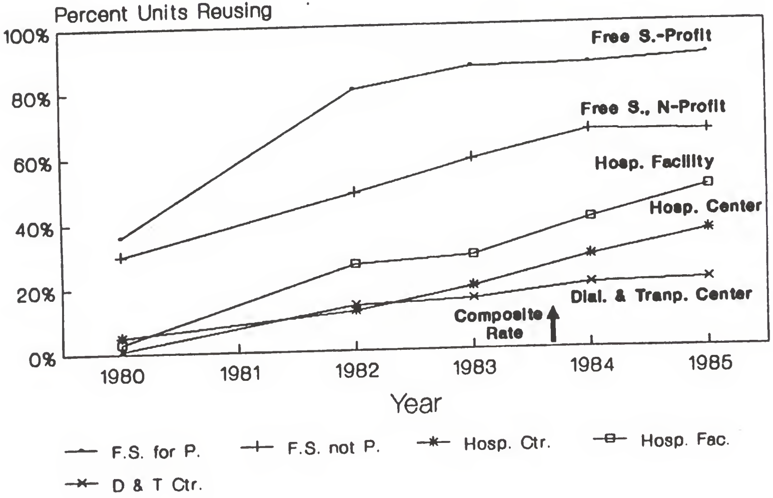


FIGURE 1

Table 3

Hypothesis Tests of the Change in Composite Rate and Change in Selected Measures for ESRD Units[a]

(Longitudinal Analysis)

		Statistical Association		
Measure To Be Explained	Mean Change	Change in Composite Rate	Type of Unit+	Sample/Census Count
Change in Reuse Policy[c] (1980–1985)	52%	No (P<0.86)	Yes; FPFS, NFPFS (P<0.01)	620
Change in Reuse Policy[d] (1982–1985)	35%	No (P<0.89)	Yes; FPFS (P<0.01)	396
Change in Patients Per Staff (1985–1982)[e]	0.88	No (P<0.38)	Yes; FPFS (P<0.01)	754

a. Reuse policy and patients per staff are from the CDC.
b. Regression with type of unit covariates.
c. No in 1980; yes in 1982 or 1983 or 1984 or 1985.
d. No in 1982; yes in 1984 or 1985.
e. Patients/staff; 1985–1982.

+. Compared to hospital center (reference group) FPFS is for-profit free standing; NFPFS is not-for-profit free standing.

Table 4

ESRD Patients Per Staff, by Type of Unit, 1980-1985[a]

Type of ESRD Unit[b]	1980	1982	1983	1984	1985	1980/1985
Freestanding						
For-Profit	2.7	2.8	3.6	3.7	3.7	0.73
Not-for-Profit	2.2	2.5	3.1	3.3	3.3	0.67
Hospital Center	1.9	2.1	2.5	2.6	2.6	0.73
Hospital Facility	2.0	2.2	2.5	2.8	2.9	0.69
Dialysis and Transplant Center	1.5	1.6	2.0	2.1	2.1	0.71
Transplant Center[c]	1.9	2.0	4.5	2.2	2.7	0.70
Total	2.2	2.3	2.9	3.1	3.1	0.71

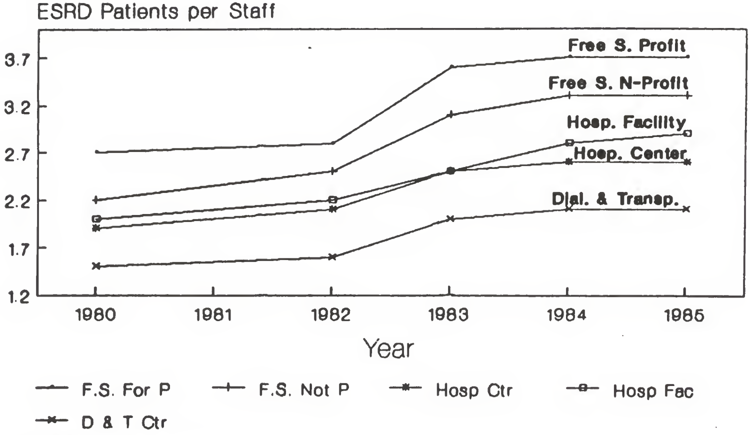
a. Data are from the National Center for Disease Control and from the Health Care Financing Administration. Estimates are based on the patients treated and staff employed in the last full week of the year. Employees are total count, i.e., are not full-time equivalents.

b. Based on HCFA classification by Master Provider Record in 1984.

c. Low number of observations, varies from 2 to 9 ESRD units.

ESRD Patients Per Staff

by Unit Type, 1980-1985



Data from CDC. Estimates based on pats.
treated / staff employed in last full
week of the year.

FIGURE 2

APPENDIX B

CHANGES IN MORBIDITY AND COSTS

CHANGES IN MORBIDITY AND COSTS

INTRODUCTION

The changes brought in by the composite rate changes of 1983 focused on the payment level for outpatient dialysis. But the payment level is only part of the question. What happens to volume and what happens to the complimentary and substitute services such as inpatient care or outpatient clinic care? All these questions flow from the changes which were instituted in 1983. There were other changes to the payment rules as well including changes in the payment for nephrologist serves both on an inpatient basis and an outpatient basis. Other changes included the establishment of the Peer Review Organizations, and changes in the rules governing what services delivered in the dialysis unit were to be covered by the dialysis payment.

In this paper we focus on two issues: the changes in the components of cost and the use of inpatient care. The latter is one measure of morbidity. The former is a major focus of the government as it attempts to reduce total spending for medical care.

The analysis is based on the experience of large samples of ESRD patients who were in the Medicare program in 1982 and 1984 with separate samples drawn from each year. By comparing the experiences of these two samples across time and across other differences in the environment they face including different levels of composite rate change, one can obtain an indication of the nature of the changes which occurred in both cost and inpatient use.

The largest change in payment rules since the inception of the Medicare program was the Prospective Payment System for inpatient care which was adopted at the same time as the Composite Rate for outpatient dialysis. But not all states went onto PPS. Four states, which had a rate setting mechanism in place, were given waivers to the PPS system and when the composite rate rule was adopted these four states had less change to contend with compared to the states in the PPS system. These four states were MD, Mass, NY, and NJ.

In the analysis below the PPS states are analyzed separately from the Waiver states. One could argue that the waiver states offer an opportunity to observe more naturally what the Composite rate change implied since the medical system in the waiver states was not also facing a new inpatient system as well as a new rate for outpatient care.

METHODS

The analysis is based on the utilization and cost experience of random samples of ESRD patients selected in 1982 and 1984. The rich detail of the Medicare information system permits an extensive analysis of many facets of the medical care utilized. The analysis is primarily based on multiple linear regression in which a utilization or cost measure is examined as a function of patient and primary dialysis provider's characteristics including the change in composite rate. The analysis will also use simple means and numerous figures for easy visual display.

The statistical tests are based on t statistics with two tailed tests for type 1 statistical errors. The quantitative magnitude of the differences are expressed in terms of percent of the mean for that measure in 1982. The basic model estimated is a multiple linear regression with 31 covariates for characteristics of the patient, primary dialysis provider, and area where the dialysis provider is located. Observations have a binary variable which assumes 1 for 1984 and 0 for 1982. The estimated coefficient for this covariate provides an estimate of the changes over time while the estimated coefficient for the change in the composite rate price gives an estimate of the impact of Composite Rate "independent" of the changes which are correlated with time i.e. those changes which were constant across areas but happening at the time period. Only the coefficients for the 1984 binary and the Composite rate are discussed and presented.

All the dependent variables of utilization and cost were deflated by the patients days at risk or DAR. This process adjusts for differing times that patient may be in the program. For example a patient who was Medicare eligible from July 1st of a year through December 31st would be at risk for 182 days; a patient eligible for the entire year would be at risk for 365 days.

The regressions which were performed to obtain a trend in the number of dialysis treatments were performed on a sample of observations covering the 1981 to 1984 period. Otherwise the specifications were the same.

The patients included in the sample frame included all Medicare eligible patients including patients who have had a kidney transplant. Patients who were transplanted in the year they appear in the sample were assigned a binary covariate with a value of one. Other patient covariates include age, race, sex, diagnosis leading to renal failure, the natural logarithm of the number of months from first dialysis to the last month they appear in the sample. In addition, patient therapy (hemodialysis, peritoneal including CAPD) including home dialysis if appropriate, are included as covariates. Primary dialysis provider characteristics include type of unit, size of unit (measured as the number of patients in 1984) and for-profit status if a freestanding unit. Charges are HCFA approved charges which is the component paid by Medicare plus the patient obligations. Inpatient charges do not include end of year settlements for the pre-PPS period and pass throughs for the PPS period. Consequently, the inpatient charges are an undercount of true HCFA cost.

The sample of patients were drawn as a systematic random sample of patients from a frame that was constructed as follows: A random sample of providers were drawn in 1984 and then the census of their patients were drawn. The number of providers selected in 1984 was 550. To this sample another sample of less than 50 providers and their patients who had been selected purposively for previous work were added to the entire frame.

The entire sample of patients for the 1982-84 period in the PPS states was 9,751 from 463 different providers. For the waiver states there were 2,265 patients from 88 different providers.

DATA

The data primarily come from the ESRD Management Information System (PMMIS) plus all the raw claims data available for each patient selected in the sample. Patient characteristics come from the PMMIS; utilization come from the PMMIS and the claims data; provider characteristics come from the Master provider records also maintained by HCFA. Area characteristic come for the Area Resource File maintained by the Health Resources Administration of the US department of Health and Human Services.

The HCFA files are dynamic in nature especially with regards to the claims data which are updated on a weekly basis. The claims data used in this analysis were current through September 30, 1986. This means that for the last day of 1984 the elapsed time was 638 days or 21.3 months; 33.3 months from the first day of 1984. It is never clear how complete a claims file is. It is possible that the 1984 claims file may not be complete i.e. some claims for 1984 may still be working their way through the system. An approximation of the potential under count for 1984 is 1 to 4 percent based on experience for California in 1982.

RESULTS

Basic tabulations of simple means for 1982-1984 by waiver and PPS states by general category are shown in Figure 1. Note that these are simple means and do not control for any covariates such as the local cost of medical services or differences in the composition of the patient mix.

Total approved charges per day at risk (DAR) was approximately $89 to $95. Inpatient dollars were 25 to 36 per DAR. Outpatient including dialysis was $46 to $50 per DAR. Physician charges were $10 to $13 per DAR. In percentage terms outpatient was 52 percent of the total; inpatient was 33 percent; physicians accounted for 13 percent; the rest was other charges. The ratios of 1984 to 1982 shown in Figure 1 indicate that the largest reductions between 1982 and 1984 were for physicians with 20 to 25 percent reductions. Despite all the attention the inpatient sector had the least reductions. On average outpatient dollars were down approximately 5 percent.

Figure 2 provides similar data but for inpatient information only. Clearly the inpatient charges for the PPS states in 1984 are most remarkable at $36 per DAR or up 41 percent over 1982. This is an undercount of the true HCFA spending since the end of year payments and other pass throughs such as capital costs are not shown in these estimates. Based on simple means, the hospital stays in the PPS states are higher in 1984 than in 1982. While the days per stay are clearly down the total days per 100 DAR is up in 1984 compared to 1982; 6.5 versus 7.3. The situation in the waiver states does not show similar changes and is notable by the significant lack of change over this period.

The simple mean charges per DAR for physicians are shown in Figure 3. Clearly the physician charges are down the most in 1984 compared to 1982. Furthermore the changes from 1984 to 1982 are similar in percent for both waiver states and for PPS states although in absolute terms the PPS states have higher rates reflecting in part the higher cost of living in the PPS states. As shown in appendix Table A1 both the HCFA wage index and the median rent show that the cost of living in the PPS states is some 9 to 12 percent higher than in the waiver states.

The results shown in Tables 1-4 present the impact estimates of the change in utilization and charges which resulted from the change in the composite rate and the secular time changes i.e. the estimate of the 1984 effect compared to 1982. These estimates are with 29 other covariates equal. The estimates separate for the waiver states and the PPS states. Tables 1 and 2 provide and overview of the total and the aggregate components. Tables 3 and 4 provide some specific details of the implied changes including the changes in morbidity as indicated by hospitalizations and hospital inpatient days.

As discussed in the methods section by estimating a separate effect for time and for the composite rate change it is hoped that the composite rate change can be separated from the secular effect. As indicated above there is reason to believe that the waiver states offer a greater chance to sort out the effects of the composite rate and the physician rate changes without the PPS system changes present. While these Tables show the right column as the impact of a ten percent change in the composite rate, it would be fairer to indicate that this is the impact of the composite rate change and anything that is correlated with it.

Overall there was not much change in the inpatient accounts in the waiver states (Table 1). However the Part B accounts were reduced substantially especially the non-dialysis Part B (especially physicians). In the aggregate total account the composite rate change was not statisically significant. The composite rate effect was statistically significant for outpatient services although the effect was fairly small.

The composite rate effect for the PPS states (Table 2) shows basically a similar pattern as for the waiver states although the effect for the non-dialysis Part B the effect is statistically significant. The major difference between the PPS and waiver states is in the inpatient utilization. Total charges are higher in 1984 than in 1982 by 43 percent.

Detail for selected indicators are shown in Tables 3 and 4 with the same format as for the first two tables. As reported for the simple means, the inpatient days and stays for the waiver states do not show any particular relationship to the time effect or the composite rate effect. Similarly the effect of the composite rate on physicians or other outpatient utilization was not particularly obvious for the waiver state patients. There is some evidence that blood for example became more of an outpatient item in 1984.

Curiously, the number of dialysis treatments per DAR appears to be up in 1984 by 7 percent compared to the 1982 level. As seen in Table 4, this same phenomenon is seen in the PPS states. A longer run look at this measure is shown in Figure 4. It is not easy to decide if the rise in 1984 is real or a random phenomena but it would seem that the rise since 1982 is larger than any of the other variations.

The hospital stays for the PPS states definitely appear to be up in 1984 compared to the 1982 level. It should be noted that this result is with other covariates held equal. The effect of the composite rate change in this regard is less clear although all the estimates are not statistically significant for inpatient utilization. Both blood and outpatient clinic charges are higher in 1984 than in 1982 but in the aggregate these are not large items.

The effects on physicians in the PPS states are similar to the effects reported for physicians in the waiver states. One difference however is that the composite rate appears to also decrease the charges for the nephroloists, this was not observed for nephrologists in the waiver states.

DISCUSSION

The data and the estimates presented in this paper cover a lot of territory. It is not easy to summarize but it would be useful to focus on the two particular estimates for the 1984 time effect and the composite rate effect.

> In all cases it is clear that physician charges were substantially lower in 1984 and that both the time effect and the composite rate effect contribute to this change.
>
> While the patients in the PPS states show increased inpatient stays, it does not appear to be attributable to the composite rate effect. It is not observed in the waiver states and the estimate is significant in only the time effect. These results do not suggest that the composite rate change is correlated with greater patient morbidity as measured by inhospital stays.
>
> The number of dialysis treatments per DAR appears to have increased in 1984 compared to 1982. Whether this a random change cannot be decided by this current research. The rise in 1984 is particularly large. But it may be a consequence of better data collection. In any case the change in composite rate was not correlated with this increase.

Table 1

Cost Impact, Composite Rate, and Other Changes, 1982-1984[a]

Waiver States

Approved Charge/ Measure Per Patient Day at Risk	Mean 1982	Change 1982-84 (P<) Secular with Time & Other	 Composite Rate -10%
Outpatient (Institution)	$51.36	-7.0% (0.01)	-2.2% (0.02)
All Other Part B	15.16	-23.7% (0.01)	-0.5% (0.88)
Inpatient	24.85	1.0% (0.91)	2.8 (0.59)
Total	91.37	-7.6% (0.05)	-0.6% (0.74)

a. 1984 data may be incomplete. Thirty-one total covariates.

Table 2

Cost Impact, Composite Rate, and Other Changes, 1982-1984[a]

PPS States

Approved Charge/ Measure Per Patient Day at Risk	Mean 1982	Change 1982-84 (P<) Secular with Time & Other	Composite Rate -10%
Outpatient (Institution)	$49.43	-3.6% (0.01)	-1.1% (0.09)
All Other Part B	17.59	-24.8% (0.01)	-7.8% (0.01)
Inpatient	25.79	43.4% (0.01)	-5.2% (0.13)
Total	93.47	5.4% (0.01)	3.5% (0.01)

a. 1984 data may be incomplete. Thirty-one total covariates.

Table 3

Changes In Selected Indications and Composite Rate, and Other Changes, 1982-1984[a]

Waiver States

Approved Charge/ Measure Per Patient Day at Risk	Mean 1982	Change (%) 1982-84 (P<)	
		Secular with Time & Other	Composite Rate -10%
Hospital Stays	0.005	10% (0.31)	-3.4% (0.44)
Hospital Days	0.076	-17% (0.15)	-2.6% (0.61)
Number of Dialysis Treatments	0.30	7% (0.01)	-1.3 (0.16)
Outpatient ($)			
Clinic	0.16	16% (0.44)	-19% (0.55)
Laboratory	2.92	-19% (0.01)	-0.06 (.04)
Blood	0.14	74% (0.05)	19% (0.28)
Nephrologists ($)	5.72	-29% (0.01)	0.3% (0.28)
Surgeons ($)	2.70	-19% (0.07)	-6% (0.20)
Other Physicians ($)[b]	4.55	-5% (0.58)	4% (0.38)
Physicians In Hospital ($)	7.78	-24% (0.01)	-2.2% (0.60)

a. 1984 data may be incomplete. Thirty-one total covariates.
b. Included in the other physician categories.

Table 4

Changes In Selected Indications and Composite Rate, and Other Changes, 1982-1984[a]

PPS States

Approved Charge/ Measure Per Patient Day at Risk	Mean 1982	Change (%) 1982-84 (P<) Secular with Time & Other	Composite Rate -10%
Hospital Stays	0.006	10% (0.01)	-12% (0.67)
Hospital Days	0.068	-1.2% (0.81)	-2.5% (0.41)
Number of Dialysis Treatments	0.30	10% (0.01)	-6.7% (0.37)
Outpatient ($)			
Clinic	0.16	50% (0.01)	-20% (0.04)
Laboratory	2.92	-37% (0.01)	-2.2% (0.30)
Blood	0.20	50% (0.01)	-9% (0.06)
Nephrologists ($)	8.15	-23% (0.01)	-10% (0.01)
Surgeons ($)	2.78	-19% (0.01)	-0.8% (0.04)
Other Physicians ($)[b]	3.00	-16% (0.02)	+1.1% (0.79)
Physicians In Hospital ($)	8.72	-25% (0.01)	-5.6% (0.10)

a. 1984 data may be incomplete. Thirty-one total covariates.
b. Included in the other physician categories.

Table A-1

Simple Means, ESRD Patients
by PPS and Waiver States, 1982, 1984[a]

Approved Charge, Other Measure Per Patient Day at Risk	Waiver States			PPS States		
	1982	1984	1984/ 1982	1982	1984	1984/ 1982
Sample Size	1,227	1,229	1.00	5,443	4,921	0.90
Total ($)[b]	92.51	89.23	0.96	93.49	95.02	1.02
Inpatient[b]	24.85	28.40	1.14	25.79	36.30	1.41
Physician	12.97	9.75	0.75	13.93	10.16	0.73
Outpatient	51.36	48.82	0.95	49.43	46.30	0.94
Other Part B	2.19	1.36	0.62	3.66	1.66	0.45
Inpatient[b]						
Billed ($)	37.57	42.93	1.14	45.34	62.72	1.38
Approved ($)	24.85	28.40	1.14	25.79	36.30	1.41
Stays	0.0051	0.0052	1.02	0.0057	0.0068	1.19
Days	0.0755	0.0747	0.99	0.0683	0.0726	1.06
Days/Stay	14.80	14.36	0.97	11.98	10.77	0.89
Physician ($)						
Neph. + Int.	5.72	4.30	0.75	8.15	5.86	0.72
Surgeon	2.70	1.90	0.70	2.78	1.98	0.71
Other Physician	4.55	3.55	0.78	3.00	2.32	0.77
Inpatient	7.78	5.41	0.70	8.72	5.85	0.67
Outpatient ($)						
(Dialysis Sessions + other charges)	47.78	43.82	0.92	44.00	42.09	0.96
Hospital Clinic	0.16	0.24	1.50	0.04	0.05	1.25
Hospital ER	0.09	0.15	1.67	0.11	0.12	1.09
Hospital laboratory	2.92	2.60	0.89	3.28	2.14	0.65

HELD.outcomes: 3723-WP03-T1-C4

	Waiver States			PPS States		
Patient Characteristics	1982	1984	1984/ 1982	1982	1984	1984/ 1982
Sample Size	1,227	1,229	-	5,443	4,921	-
Prop. Female	0.43	0.43	1.00	0.46	0.48	1.04
Prop. Black	0.36	0.35	0.97	0.31	0.31	1.00
Prop. Diabetic	0.10	0.13	1.30	0.12	0.18	1.50
Prop. Hypertensive	0.13	0.20	1.54	0.16	0.21	1.31
Prop. Glomerulonephritis	0.16	0.22	1.38	0.17	0.21	1.24
Prop. Transplant this year	0.07	0.04	0.57	0.07	0.07	1.00
Prop. New Patients	0.12	0.17	1.42	0.13	0.18	1.38
Prop. <20 years	0.02	0.02	1.00	0.02	0.02	1.00
Prop. 20-44 years	0.31	0.24	0.77	0.29	0.25	0.86
Prop. 45-64 years	0.42	0.40	0.95	0.46	0.40	0.87
Prop. 65+ years	0.24	0.35	1.46	0.23	0.34	1.48
Prop. on CAPD	0.02	0.07	3.50	0.02	0.09	4.50
MRENT80	224.64	225.32	1.003	209.97	208.81	0.994
HCFA WAGE INDEX	1.221	1.189	0.974	1.095	1.092	0.997

---

a. 1984 may be incomplete. Data are from a HCFA file created September 30, 1976.

b. Excludes end of year adjustments for the pre PPS period and "pass throughs" for the past PPS period.

Table B-1

Parameter Estimates, Composite Rate[a]

Total Approved Charges
PPS States

Measure Per Patient Day at Risk	Mean 82-84	1984 Binary b (P)	ln (P84/P82) b (P)
Total Approved Charges	$93.73	5.06 (0.01)	32.81 (0.00)
ln (T. Approved Charges)	$ 4.33	0.003 (0.87)	0.24 (0.04)

a. PPS states only. 1982, 1984 n=9,751 patients from 463 different providers. 31 total covariates including age, sex, race, months since first dialysis, diagnosis, type, profit status, size of provider, local price levels measured by the HCFA wage index and the median monthly rent for resident population. 1984 data may not be complete.

Table B-2

Parameter Estimates, Composite Rate[a]

Outpatient Approved Charges
PPS States

Measure Per Patient Day at Risk	Mean 82-84	1984 Binary		ln (P84/P82)	
		b	(P)	b	(P)
Outpatient Approved Charges[b]	48.40	-1.77	(0.00)	5.54	(0.09)
ln (Outpat. Approved Charges)	3.71	-0.03	(0.14)	0.07	(0.57)
Number of Dialysis Treatments[c]	0.30	0.03	(0.00)	0.02	(0.37)
Outpatient					
Hospital	3.84	-0.80	(0.00)	2.67	(0.00)
Clinic	0.04	0.02	(0.01)	0.08	(0.04)
Emergency Room	0.11	0.006	(0.51)	0.03	(0.65)
Laboratory	2.64	-1.08	(0.00)	-0.64	(0.30)
Radiology	0.39	0.01	(0.00)	0.11	(0.49)
Pharmacy	0.86	0.15	(0.02)	0.81	(0.04)
Blood	0.14	0.07	(0.00)	0.18	(0.06)
Ambulance	0.02	0.01	(0.27)	-0.02	(0.79)
Physical Therapy	0.07	0.04	(0.05)	0.0006	(1.00)
Other	8.56	-12.25	(0.00)	-4.54	(0.00)
Dialysis Supplies	0.32	-0.35	(0.00)	0.49	(0.28)
Dialysis Sessions	35.03	11.65	(0.00)	9.57	(0.00)
Dialysis Equipment Rental	0.07	0.11	(0.00)	-1.49	(0.00)
Home Support Services	0.22	-0.05	(0.31)	-0.42	(0.21)

---

a. PPS states only. 1982, 1984 n=9,751 patients from 463 different providers. 31 total covariates including age, sex, race, months since first dialysis, diagnosis, type, profit status, size of provider, local price levels. 1984 data may not be complete.

b Excludes physician and other part B.

c. From MIS count. Also controls for inpatient days.

Table B-3

Parameter Estimates, Composite Rate[a]

Inpatient Approved Charges
PPS States

Measure Per Patient Day at Risk	Mean 82–84	1984 Binary b	1984 Binary (P)	ln (P84/P82) b	ln (P84/P82) (P)
Billed Charge	51.87	15.20	(0.00)	−1.00	(0.96)
ln (Billed Charges)	2.37	0.17	(0.00)	0.18	(0.56)
Approved Charges	29.98	11.19	(0.00)	13.47	(0.13)
ln (Approved Charges)	2.11	0.37	(0.00)	0.36	(0.19)
Hospitalizations	0.006	0.0006	(0.01)	−0.0007	(0.67)
ln (Hospitalizations)	0.006	0.0006	(0.01)	−0.0006	(0.72)
Inpatient Days	0.069	−0.0008	(0.81)	−0.0167	(0.41)
ln (Inpatient Days)	0.061	−0.0013	(0.61)	−0.0088	(0.57)

a. PPS states only. 1982, 1984 n=9,751 patients from 463 different providers. 31 total covariates including age, sex, race, months since first dialysis, diagnosis, type, profit status, size of provider, local price levels. 1984 data may not be complete.

Table B-4

Parameter Estimates, Composite Rate[a]

Physician and Other Part B
PPS States

Measure Per Patient Day at Risk[b]	Mean 82-84	1984 Binary		ln (P84/P82)	
		b	(P)	b	(P)
Total Part B (Non-Dialysis)	15.37	-4.37	(0.00)	13.80	(0.00)
ln (Total Part B-Non-Dialysis)	2.26	-0.42	(0.00)	1.33	(0.00)
Physicians—Total	12.11				
Nephrologists & Internists	7.18	-1.65	(0.00)	7.34	(0.00)
ln (Neph. & Intern.)	1.69	-0.28	(0.00)	1.35	(0.00)
Surgeons	2.36	-0.54	(0.00)	2.14	(0.04)
ln (Surgeons)	0.61	-0.20	(0.00)	0.47	(0.00)
Other Physicians	2.57	-0.40	(0.02)	-0.29	(0.79)
ln (Other Physicians)	0.77	-0.18	(0.00)	0.11	(0.42)
In-Hospital Physicians[c]	7.25	-2.18	(0.00)	4.09	(0.10)
ln (In-Hospital Phys.)[c]	1.21	-0.48	(0.00)	0.46	(0.02)
Other Part B	2.64	-1.73	(0.00)	4.77	(0.00)
ln (Other Part B)	0.45	-0.18	(0.00)	0.61	(0.00)

[a] PPS states only. 1982, 1984 n=9,751 patients from __ different providers. 31 total covariates including age, sex, race, months since first dialysis, diagnosis, type, profit status, size of provider, local price levels. 1984 data may not be complete.

[b] Ln is the natural logarithm.

[c] Included in above items.

Table C-1

Parameter Estimates, Composite Rate[a]

Total Approved Charges
Waiver States

Measure Per Patient Day at Risk	Mean 82-84	1984 Binary b (P)	ln (P84/P82) b (P)
Total Approved Charges	$89.91	-6.93 (0.05)	5.32 (0.74)
ln (T. Approved Charges)	4.31	-0.057 (0.07)	0.21 (0.16)

a. Waiver states only: MD; MASS; NJ; NY. 1982, 1984 n=2,265 patients from 88 different providers. 31 total covariates including age, sex, race, months since first dialysis, diagnosis, type, profit status, size of provider, local price levels measured by the HCFA wage index and the median monthly rent for resident population. 1984 data may not be complete.

Table C-2

Parameter Estimates, Composite Rate[a]

Outpatient Approved Charges
Waiver States

Measure Per Patient Day at Risk	Mean 82-84	1984 Binary		ln (P84/P82)	
		b	(P)	b	(P)
Outpatient Approved Charges[b]	$50.45	-3.58	(0.00)	11.51	(0.02)
ln (Outpat. Approved Charges)	3.76	-0.04	(0.21)	0.30	(0.05)
Number of Dialysis Treatments[c]	0.30	0.02	(0.00)	0.04	(0.16)
Outpatient					
Hospital	4.07	-0.21	(0.16)	2.26	(0.00)
Clinic	0.20	0.082	(0.44)	0.30	(0.55)
Emergency Room	0.11	0.055	(0.00)	0.11	(0.18)
Laboratory	2.65	-0.576	(0.00)	1.82	(0.04)
Radiology	0.31	0.005	(0.89)	0.08	(0.65)
Pharmacy	0.73	-0.327	(0.00)	-0.60	(0.17)
Blood	0.20	0.104	(0.05)	-0.26	(0.28)
Ambulance	0.002	0.003	(0.39)	-0.00	(0.99)
Physical Therapy	0.07	-0.016	(0.58)	0.032	(0.81)
Other	11.10	-16.42	(0.00)	20.14	(0.00)
Dialysis Supplies	0.09	-0.127	(0.02)	-0.04	(0.86)
Dialysis Sessions	35.28	12.84	(0.00)	-2.71	(0.52)
Dialysis Equipment Rental	0.01	0.002	(0.84)	0.10	(0.08)
Home Support Services	0.10	-0.28	(0.00)	-0.29	(0.20)

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a. Waiver states only: MD; MASS; NJ; NY. 1982, 1984 n=2,265 patients from 88 different providers. 31 total covariates including age, sex, race, months since first dialysis, diagnosis, type, profit status, size of provider, local price levels measured by HCFA wage index and median monthly rent in 1980. 1984 data may not be complete.

b. Exclude Physician and other part B.

c. From MIS count. Also controls for inpatient days.

Table C-3

Parameter Estimates, Composite Rate[a]

Inpatient Approved Charges
Waiver States

Measure Per Patient Day at Risk	Mean 82-84	1984 Binary b	1984 Binary (P)	ln (P84/P82) b	ln (P84/P82) (P)
Billed Charge	37.84	0.50	(0.91)	5.82	(0.78)
ln (Billed Charges)	2.03	0.04	(0.70)	0.11	(0.79)
Approved Charges	25.12	0.24	(0.93)	-6.89	(0.59)
ln (Approved Charges)	1.83	0.02	(0.78)	-0.15	(0.68)
Hospitalizations	0.005	-0.0005	(0.31)	-0.0017	(0.44)
ln (Hospitalizations)	0.005	-0.0004	(0.33)	-0.0016	(0.43)
Inpatient Days	0.072	-0.0131	(0.15)	-0.0215	(0.61)
ln (Inpatient Days)	0.062	-0.0064	(0.23)	-0.0039	(0.87)

a. Waiver states only: MD; MASS; NJ; NY. 1982, 1984 n=2,265 patients from 88 different providers. 31 total covariates including age, sex, race, months since first dialysis, diagnosis, type, profit status, size of provider, local price levels measured by HCFA wage index and median monthly rent of the resident population. 1984 data may not be complete.

Table C-4

Parameter Estimates, Composite Rate[a]

Physician and Other Part B
Waiver States

Measure Per Patient Day at Risk[b]	Mean 82–84	1984 Binary b (P)	ln (P84/P82) b (P)
Total Part B (Non-Dialysis)	14.34	−3.59 (0.00)	0.70 (0.88)
ln (Total Part B-Non-Dialysis)	2.19	−0.41 (0.00)	−0.05 (0.83)
Physicians—Total	11.61		
Nephprologists & Internists	5.03	−1.67 (0.00)	−1.68 (0.28)
ln (Neph. & Intern.)	1.22	−0.33 (0.00)	−0.42 (0.04)
Surgeons	2.38	−0.51 (0.07)	1.64 (0.20)
ln (Surgeons)	0.67	−0.15 (0.00)	0.27 (0.16)
Other Physicians	4.20	−0.22 (0.58)	1.61 (0.38)
ln (Other Physicians)	1.05	−0.12 (0.01)	0.66 (0.00)
In-Hospital Physicians[c]	6.79	−1.86 (0.01)	1.71 (0.60)
ln (In-Hospital Phys.)[c]	1.19	−0.34 (0.00)	0.32 (0.24)
Other Part B	1.67	−1.15 (0.01)	−1.28 (0.53)
ln (Other Part B)	0.33	−0.21 (0.00)	−0.09 (0.57)

a. Waiver states only: MD; MASS; NJ; NY. 1982, 1984 n=2,265 patients from 88 different providers. 31 total covariates including age, sex, race, months since first dialysis, diagnosis, type, profit status, size of provider, local price levels measured by HCFA wage index and median monthly rent in 1980. 1984 data may not be complete.

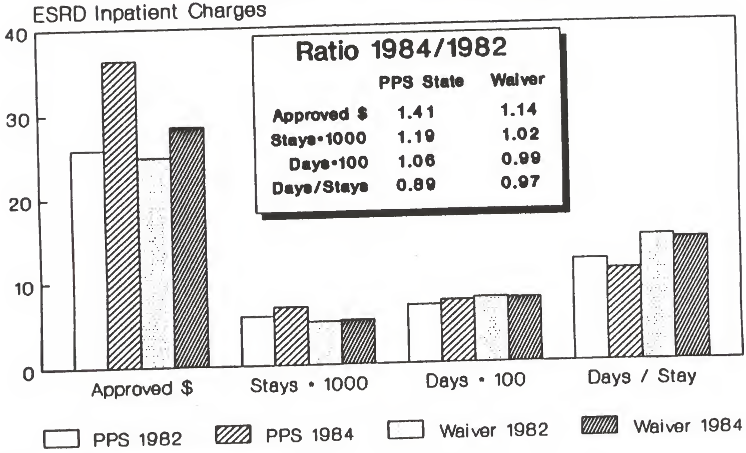
b. Ln is the natural logarithm.

c. Included in above items.

ESRD Charges Per DAR*

1982-1984

INPATIENT - SIMPLE MEANS



Ratio 1984/1982

	PPS State	Waiver
Approved $	1.41	1.14
Stays•1000	1.19	1.02
Days•100	1.06	0.99
Days/Stays	0.89	0.97

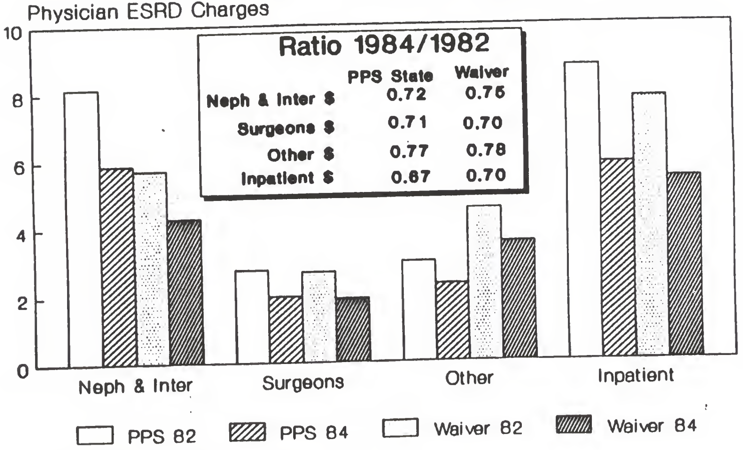
*Patient Days at Risk; 1984 data may be incomplete

FIGURE 2

ESRD Charges Per DAR*

1982-1984

PHYSICIAN - SIMPLE MEANS



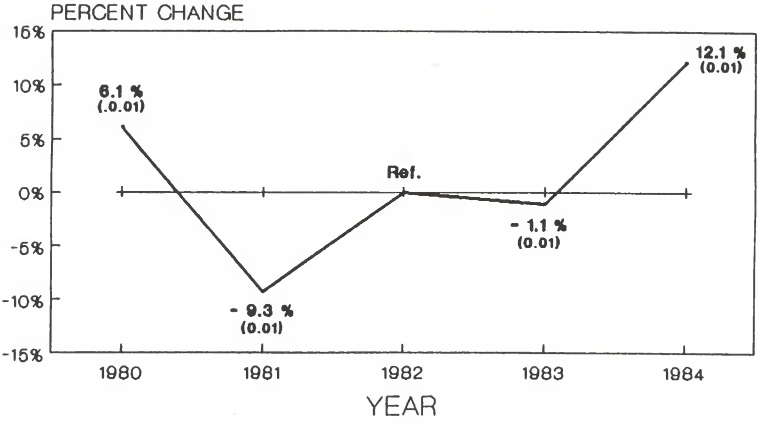
Ratio 1984/1982

	PPS State	Waiver
Neph & Inter $	0.72	0.76
Surgeons $	0.71	0.70
Other $	0.77	0.78
Inpatient $	0.67	0.70

Patient Days at Risk; 1984 data may be incomplete

FIGURE 3

Changes in the Number of Dialysis Treatments per DAR, 1980-1984*



- PPS States; 41 total covariates.

y = 0.283 trts/DAR

FIGURE 4

APPENDIX C

CHANGES IN ACCESS FOR ESRD PATIENTS AND SERVICES

1982-1985

CHANGES IN ACCESS FOR ESRD PATIENTS AND SERVICES, 1982-1985

Introduction

One of the major issues resulting from the 1983 change in the price paid by Medicare for outpatient dialysis is the possible change in access to medical care. Although it is most difficult to define the precise level of access that society wants to offer to patients, an assessment of the impact of such a price change on the direction of change in access is important. For example did access improve or get worse even if it may be difficult to precisely define how much the overall change was.

Change in access is an issue because of the mixed nature of the US medical care system for ESRD patients as well as all patients receiving public support for their care. While the government pays the great bulk of the cost of care it is primarily non-government agents (physicians, dialysis units) decide to accept or not to accept patients for care. One of the major determinants in that decision is the price paid. Therefore it is most reasonable to ask whether the price change for outpatient dialysis in 1983 lead to improved access, less access, or no change in access.

This paper will examine a whole range of indicators with particular focus on changes in these measures over time and crossectionally i.e. where the price change was large compared to where it was small. Since the price change for outpatient dialysis was not the only change in payment policy which occurred in 1983 it is important to try and separate these effects which are correlated with time from the crossectional effects.

Methods

The analysis is straightforward. First some basic trends in the number of patients and providers are developed. Data from the Centers for Disease Control (CDC) and the Health Care Financing Administration are compared. Then basic data on the size and concentration of providers are developed. Mean measures of access are compared over time and given time, across areas of different levels of the price change of 1983. The bulk of the analysis is tabular with trends displayed by graphs and other measures of the rate of change.

To obtain the degree of concentration in the ESRD dialysis community a "Lorentz Type" curve is plotted. This figure is named for the Scandinavian economist who developed this concept to measure the concentration of income in a society. It is a measure of concentration for which the concentration standard for comparison is the case of equal distribution. For example if all providers were the same size the Lorentz-like curve would be coincident with the 45° line. Deviations in this measure and changes in this measure over time give an indication of whether the community of ESRD dialysis and transplant units are becoming more or less concentrated e.g. are the large units accounting for more or less of the total patient load.

Several measures of access are compared for 1982 and 1984. The basic comparisons are hypothesis tests using chi-square statistics, and multiple linear regression.

The hypothesis tests comparing data from the 1982 and 1984 Surveys of Dialysis Institution Directors uses multiple linear regression to test for differences between 1982 and 1984. The list of covariates included whether the observation was in a large metropolitan area (defined as having more than 5 ESRD providers in 1984) and the type of ESRD unit. For the 1984 observations, the change in composite price for that institution was also included as a covariate.

Data

The information used in this analysis came from three sources. First the data from the National Centers for Disease Control (CDC) derive from their annual (a few years have been missed) survey of all ESRD providers. The survey is administered by HCFA with the annual Facility Survey. The wisdom is that cooperation is high with a near census of providers. The experience of this project suggests that ESRD providers who do not have patients i.e. they may have a Medicare provider number but may not have any dialysis patients or may be a transplant center that does not do any dialysis, may not respond to the CDC survey.

The second source of data is the ESRD Management Information System maintained by HCFA. The third source of data is the Surveys of Dialysis Institutions done by Held et. al. in 1982 and 1984. The 1982 survey had 654 completions. The 1984 survey was much more limited in scope and had 135 completions. Both surveys were completed by the Medical Director. While the 1982 survey was a systematic random sample of all providers the 1984 sample was focused on large urban areas.

Results

Basic Counts of Providers and Patients

Counts of ESRD providers and patients from both CDC and HCFA are shown in Table 1. At first glance it would appear that the two sources are in disagreement. But in essence they do report the same state of the world. CDC focuses on the incenter maintenance dialysis patient. (After 1983, the question focuses on incenter hemodialysis patient). To find comparable numbers from the HCFA estimates one must focus on incenter patients only i.e. exclude the home patients and the CAPD (continuous ambulatory peritoneal dialysis). In addition HCFA's data have some records for providers who have few or no patients (here defined as less than ten patients at year end). CDC records are focused primarily on providers who have in-center dialysis patients. Both sources show approximately 43,000 (incenter) patients at the end of 1980. By 1985 the CDC estimate is for 62,000; HCFA shows somewhat more at 67,800 total patients.

The data shown in Figure 1 show that both sources report comparable levels of patients and rates of change over time. Similar data for providers are shown in Figure 2. When focused on the providers with more than 10 patients the provider tally are quite comparable from both sources.

The average size of ESRD units by type are shown for 1980 and 1985 (CDC data) in Figure 3 and Table 2. The distribution of patients (incenter) by type of provider are shown in Table 2 and Figure 4. The free standing units are the largest with average patients of 57 to 64. There has been a 15 percent increase in the number of patients per unit across all types of units between 1980 and 1985. The freestanding units collectively accounted for 56 percent of the patients in 1980 but by 1985 had grown in numbers to the point that they accounted for 62 percent of the total patients. Hospital facilities grew substantially in average size but in the aggregate they only account for five percent of ESRD patients. Hospital centers account for a fifth of the total incenter patients. The free standing units have increase their share of patients by 6 percent while the hospital centers, and the dialysis and transplant centers have reduced their share by 2 percent and 4 percent respectively

The concentration of dialysis providers is plotted for 1982 and 1985 in Figure 5. In effect the data were so close that the plotter had trouble putting both plots on the same figure. The essence of these "Lorentz type plots" is to show the relationship of the size of the dialysis unit to the percent of the patients treated by similar size units. For example this figure shows that the smallest 20 percent of the providers (horizontal axis) had only 3 percent of the patients. On the other hand the largest 20 percent of the providers had over 50 percent of the patients.

This distribution was essentially unchanged between 1980 and 1985. While the number of providers and patients was growing at 7 to 8 percent the average size and the overall concentration of the ESRD providers was not changing.

Impact On Access of the 1983 Reduction In Composite Price

The data presented so far on size and number of units bear on the impact on access of the numerous changes in payment policy enacted in 1983. The previous tables and figures for example suggest that there were not major changes in the rate of growth of ESRD patients and providers over the entire period 1980-1985. (The HCFA data are not for exactly the same time intervals in the middle period. As a result the rates of growth in the interim are not quite comparable to the CDC data). Both the CDC and the HCFA data show between 852 and 893 providers (with more than 10 patients) in 1980; by 1985 they are in agreement at 1141 and 1142 respectively. The rates of growth for the before and after 1982 period (CDC) show if anything that the rate of growth in the number of providers has possibly increased in the post 1982 period compared to the pre 1982 period. The rates of growth in providers were 4.8 and 6.8 for the 1980-82 and 1982-85 periods respectively.

The fact that the average size of the units was not changing over this period also bears on access. With growth in the total number of providers it seems most likely that the convenience of access has not changed for the worse and may have changed for the better.

Specific Measures of Access Change

Shown in Table 3 are a series of tests comparing responses by medical directors in 1982 with responses to identical questions in 1984 i.e. before and after the composite rate change of 1983. Most of the measures do not show any change between 1982 and 1984 (e.g.want more patients; offer and evening dialysis shift). A limited number show an improvement in access (e.g. accept angina patients). One indicator shows a worsening in access (free transportation) but this indicator shows a worsening of access only at a P level that is excess of the usual criteria (P< 0.13).

The other data of this same table show that none of the measures were statistically associated with the change in the Composite Rate for outpatient dialysis. This represents a test of the null hypothesis that places with high levels of price decrease have the same set of access measures as the places with small decreases in the composite rate. Again, the changes in access are not associated with the changes in price.

Shown in Figures 6 and 7 and Table 4 are results of additional tests of the possible impact of the change in the Composite rate on access to ESRD services. These figures for SMSAs show the growth in ESRD patients and providers (with 10 or more patients over the 1980-1985 period. The three separate plots in each figure are the rates for SMSAs that the 1983 reduction in price represented large reductions; medium reductions; and small reductions. The classification into large medium and small in based on the distribution of the cuts with each SMSA being the weighted mean of the reduced rate for each patient in the SMSA. Due to the exclusion of a number of providers (12 percent), that could not be located in 1985, one should be careful examining the data for this year in Figures 6 and 7.

The data in these plots show that the rates of growth in both patients and providers were essentially the same. In other words the rates of growth in patients and providers did not materially differ by the size of the reduction in the composite rate.

Discussion

Although it is difficult to define the precise level of access to medical services for ESRD patients, it is possible to examine a series of measures that provide some indication of the direction of change in access that may have occurred as a consequence of the rate changes in 1983. Most indicators of access presented above do not suggest that access to medical care changed for the worse over the 1980-1985 period. Furthermore there was no evidence in the data presented here that the changes in access were correlated with the 1983 changes in the composite rate.

Changes in the total number of ESRD providers (with 10 or more patients) and incenter patients does not indicate that there were substantial changes indicating worse access after 1982 compared to before 1982. Furthermore the data presented here do not suggest that these basic findings are different in SMSAs where the composite rate reduction was large compared to where the reduction was small.

Focusing, as was done above, on incenter patients is most likely a conservative approach in that the post 1982 period contain substantial changes in the number of patients that would normally be counted outside the dialysis center. In the post 1982 period there has been growth in the number of kidney transplant patients (6,933 in 1984 up from 4,270 in 1979) and CAPD patients see Table 5 and Figure 8. While the number of home hemodialysis patients has declined some what, the total number of home patients, if CAPD patients are included, has increased substantially.

The counts of patients and providers in this paper as well as the growth in patients by SMSAs with large and small cuts in the composite rate have been based on a near census and sampling errors due to sample size restrictions are not an issue. The access measures based on the 1982 and 1984 Survey of Dialysis

Institution Directors is not as definite. The 1982 sample was very large by most standards (654) approaching a significant portion of the total population of providers. The 1984 sample was more limited with only 134 providers in large metropolitan areas. Whether statistical power is an issue with this sample deserves more attention and further work.

Table 1

ESRD Patients and Providers,
CDC and HCFA, 1980-1985[a]

	Center for Disease Control					Health Care Financing Administration[c]				
	Year			Annual Rate of Change(%)		Year			Annual Rate of Change(%)	
	1980	1982	1985	1980-82	1982-85	1980	1982	1985	1980-82	1982-85
Providers at Year End										
0 Pats last wk	37	5	4	-63.2	-7.1	61	77[d]	167[e]	26.0	29.0
1-10 Pats last wk	99	87	109	- 6.3	7.7	109	106[d]	124[e]	- 2.8	5.3
GT10 Pats last wk	852	935	1,141	4.8	6.8 6.0 (80-85)	893	993[d]	1,142[e]	n.a.	5.0 (80-85)
Total Pats last wk	988	1,027	1,254	2.0	6.8	1,063	1,176[d]	1,433[e]	n.a.	n.a.
Total (In-Center) Patients at Year End (K)[b]	42.6	49.3	62.2	7.6	8.0	43.4	54.0	67.8	11.6	7.8
Total Patients (K)						52.4	65.8	84.8	12.1	8.7

---

a. Data are from the National Center for Disease Control and Health Care Financing Administration Facility Survey

b. Presumably includes Medicare and non-Medicare in-center patients in CDC.

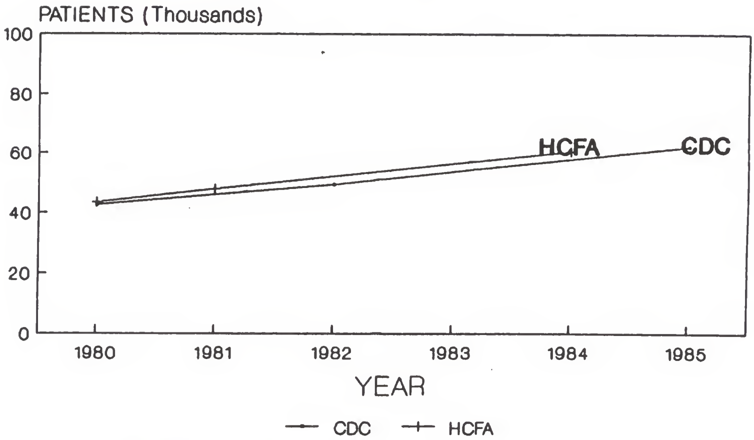
c. Annual Facility Survey

d. 1981

e. 1984.

In Center Dialysis Patients

CDC and HCFA, 1980-1985

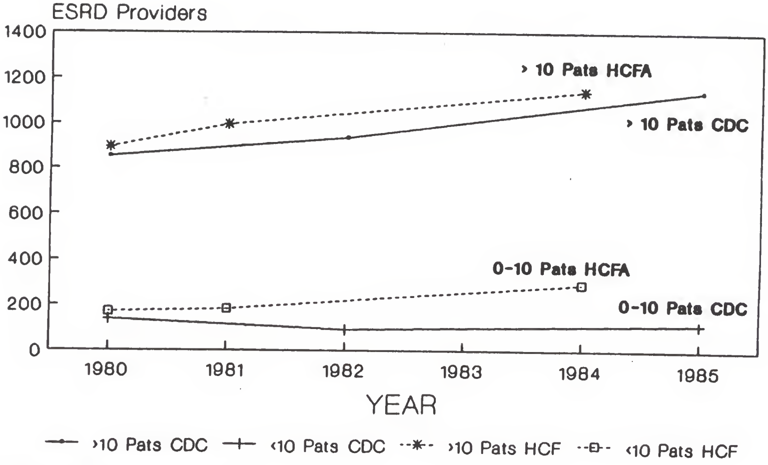


Data are from CDC and HCFA's Fac Survey.
Both are for the end of the calendar yr.
Patients include Medicare and Non-Med.

FIGURE 1

ESRD Providers

CDC and HCFA, 1980-1985



Data are form CDC Control and
HCFA's Facility Survey

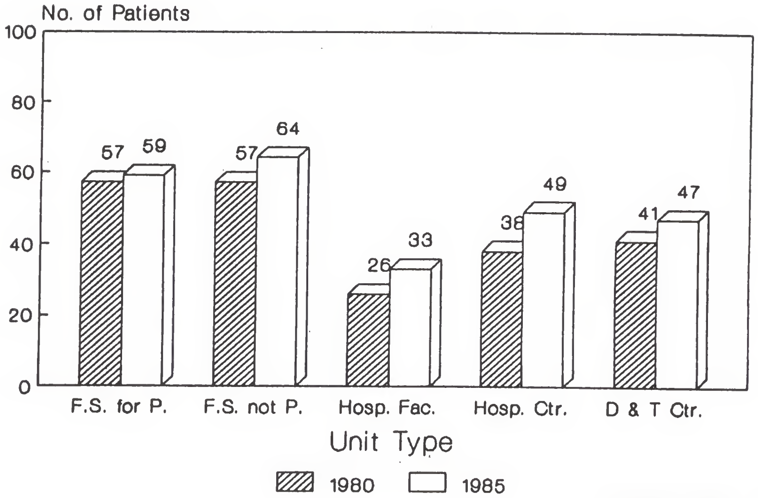
FIGURE 2

Table 2

Mean Patients Per Unit and Percentage of Total Patients, by Type of Unit, 1980 and 1985[a]

ESRD Unit Type	1980 Mean Patients	1980 % Total Patients	1985 Mean Patients	1985 % Total Patients
Freestanding				
For-Profit	57	45	59	49
Not-for-Profit	57	11	64	13
Hospital Center	38	26	49	24
Hospital Facility	26	5	33	5
Dialysis and Transplant Center	41	12	47	9
Transplant Center[b]	63	1	34	<1
Total[b]	46	100	54	100

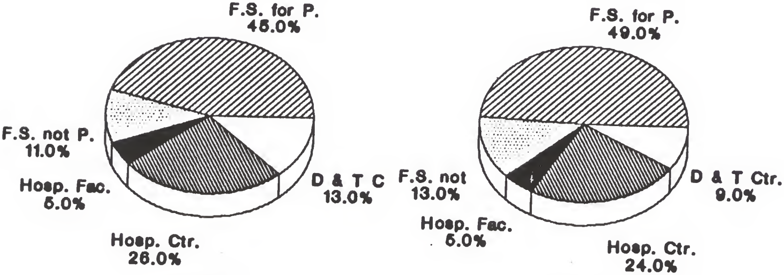
a. CDC data. Incenter patients.
b. Includes Unknown unit type.



Average ESRD Unit Size, 1980-1985

FIGURE 3

Distribution of ESRD Patients
by Type of Unit, 1980 & 1985

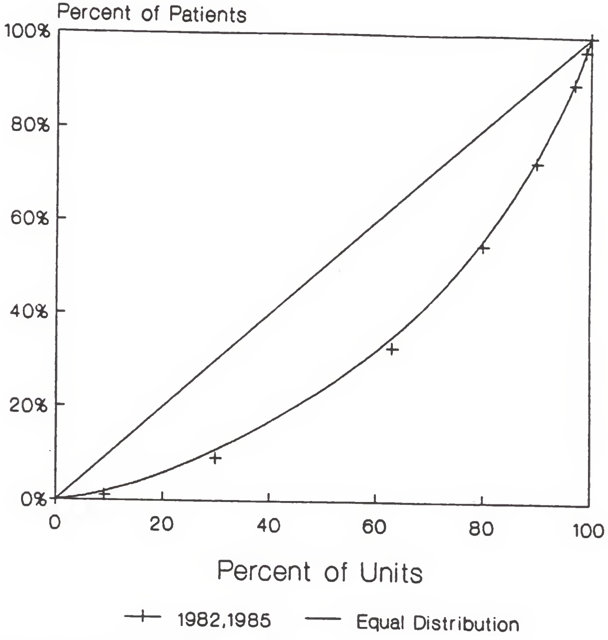


1980

1985

FIGURE 4

Concentration of ESRD Units by Size, 1982,1985



Data are from CDC's Annual Survey.
Excludes providers with 0 patients.
Patients are of the last week

FIGURE 5

Table 3
Changes in Measures of Access to Dialysis Services, 1982, 1984[a]

Measure of Access (Medical Director Responses)	Mean of Sample (%)	1984 compared to 1982(%)		Composite Rate Change (%)	
		b	(P)	b	(P)
1. Accept Patients (yes):					
A. Hepatitis	61	-5	(<0.42) no change	-2	(<0.36) no change
B. Blind Diabetes	99	0	(<0.62) no change	-.01	(<0.72) no change
C. Angina/Cardiac Abnormalities	89	18	(<0.01) better	.1	(<0.60) no change
D. Elderly >70 yrs old	99	1	(<0.40) no change	0	(<0.81) no change
E. Children, <14 yrs old	45	-1	(<0.84) no change	.06	(<0.81) no change
2. Want More Patients	83	5	(<0.34) no change	-.3	(<0.13) no change
3. Have capacity for More Patients	74	1	(<0.87) no change	.1	(<0.54) no change
4. Opinion: Patients have choice of >1 unit:					
A. Always	45	12	(<0.08) better	-.1	(<0.69) no change
B. Always/Sometimes	73	7	(<0.19) no change	.05	(<0.83) no change
5. Dialysis Shifts operating at capacity:					
A. All	31	-.3	(<0.96) no change	.1	(<0.63) no change
B. All/Some	90	1	(<0.90) no change	.1	(<0.54) no change

TABLE 3, continued

Measure of Access (Medical Director Responses)	Mean of Sample (%)	1984 compared to 1982(%)		Composite Rate Change (%)	
		b	(P)	b	(P)
6. Patient Services (yes):					
A. Free Transportation	17	-8	(<0.13) no change(?)	.2	(<0.26) no change
B. Individual TV's	52	9	(<0.19) no change	.2	(<0.31) no change
C. Evening shifts	62	5	(<0.42) no change	-.2	(<0.44) no change

a. Sample size is approximately 696 total, of whom 79 percent were in 1982. Hypothesis test controls for large urban area.

Table 4

Changes in ESRD Providers and Patients by Size of the Average Composite Rate Reduction, 1980-1985[a]

SMSAs

ESRD Providers and Patients	Year	SIZE OF THE REDUCTION ($) Large LT-18	 Medium -18 to -9.5	 Small GT -9.5
Providers (GT 10 Patients)	1980	174	245	244
	1985	208	332	303
	85/80	1.20	1.36	1.24
Patients (K)	1980	9.2	13.8	13.5
	1985	13.1	20.4	19.0
	85/80	1.41	1.48	1.41

a. Excludes approximately 12 percent of providers and 8 percent of patients for both SMSA and non-SMSA areas who could not be located in each year.

Growth 1980-1985
ESRD Patients

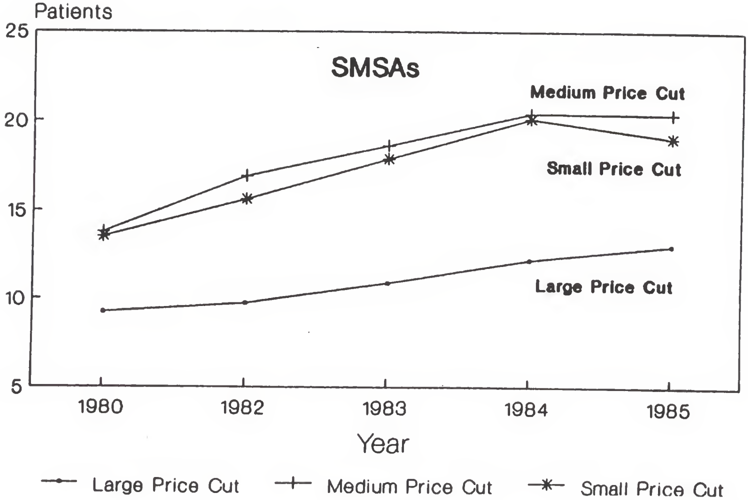
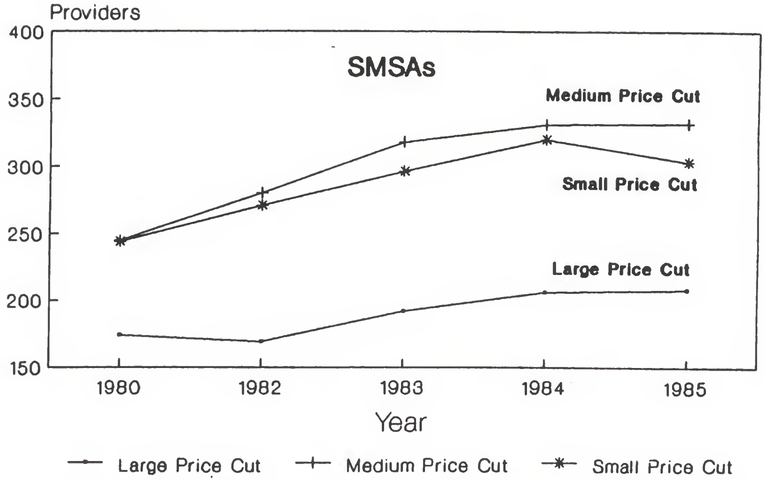


FIGURE 6

Growth 1980-1985

ESRD Providers [a]



a. Includes units with ›10 patients.

FIGURE 7

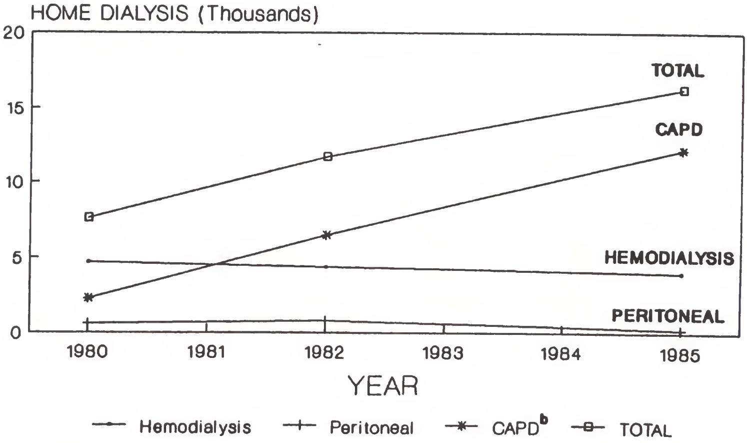
Table 5

Home Dialysis Patients, 1980-1985[a]
(numbers in thousands)

	Year			Annual Rate of Change (%)	
	1980	1982	1985	1980-82	1982-85
Home Dialysis					
Hemodialysis	4.7	4.4	4.0	-3.2	-3.1
Peritoneal	0.6	0.8	0.2	15.5	-36.7
CAPD[b]	2.3	6.5	12.2	68.1	23.1
Total	7.6	11.7	16.3	24.1	11.6

a. Data are from the Facility Surveys.
b. Continuous ambulatory peritoneal dialysis and continuous cycling peritoneal dialysis.

Home Dialysis Patients,
1980-1985[a]



a. Data are from the Facility Survey
b. Continuous ambulatory peritoneal dial and continuous cycling peritoneal dial.

FIGURE 8

Table A-1

Changes in ESRD Providers and Patients by Size of the Average Composite Rate Reduction, 1980-1985[a]

NON-METROPOLITAN AREAS

ESRD Providers and Patients	Year	SIZE OF THE REDUCTION ($) Large LT-20	 Medium -20 to -14.5	 Small GT -14.5
Providers (GT 10 Patients)	1980	65	10	31
	1985	114	22	42
	85/80	1.75	2.20	1.35
Patients (K)	1980	1.93	0.34	0.70
	1985	4.03	0.70	1.32
	85/80	2.09	2.06	1.89

---

a. Excludes approximately 12 percent of providers and 8 percent of patients for both SMSA and non-SMSA areas who could not be located in each year.

Table A.2

Number of ESRD Units by Size and Year 1980-1985[a]

(units with more than 10 patients)

Size of Unit (Patients)	1980	1982	1985	Annual Rate of Changes (%) 80-82	Annual Rate of Changes (%) 82-85
11-50	547	572	672	2.3	5.5
51-100	234	276	345	8.6	7.6
101-200	64	79	116	11.1	13.5
>200	7	8	8	6.9	0.0
Total	852	935	1,141	4.8	6.8

[a] CDC data; patients last week of year.

APPENDIX D

ESTIMATING THE CHANGE IN THE MEDICARE APPROVED CHARGE FOR OUTPATIENT DIALYSIS, 1982-1984

ESTIMATING THE CHANGE IN THE MEDICARE APPROVED CHARGE FOR OUTPATIENT DIALYSIS
1982-1984

INTRODUCTION

A necessary input for evaluation of the impact of the change in the price Medicare pays for outpatient maintenance dialysis is an estimate of the change for each provider of ESRD services. By change is meant the approved charge for the period after the implementation of the Composite Rate in August 1983 compared to the period before implementation. This project has used the approved rate for 1982 as the before period.

Precise data for each provider exist for the composite rate set in August 1983. However for the earlier period precise data for each hospital provider do not exist in the HCFA data system. These data are only available at the intermediary/carrier level. For the freestanding units with two exceptions, all were being paid $138 in 1982. While the official rate for hospitals was the same as that for the freestanding units many of the hospitals had exceptions and were paid at a rate above the official rate. Since they were paid on a "cost" basis it is likely that some of the hospital units may have received less than the official rate of $138 in 1982. In the 1983 composite rate most all exceptions to the official price were cancelled and nearly all units were paid on a prospective price which was set by formula.

METHODS

To estimate the 1982 level of the approved charge for outpatient maintenance hemodialysis, an estimation procedure was used based on known characteristics of patients including payment levels for selected services, and known characteristics of their dialysis provider. The procedure was based on a process of selecting for each provider those patients for whom the data for outpatient dialysis was most likely to be uncomplicated by other factors such as home dialysis charges, a transplant, hospital days, not eligible for the entire year, not being a hemodialysis patient etc. After the census of patients fitting these characteristics was selected, the average approved charge for maintenance hemodialysis was calculated for each patient by calculating the ratio of total approved charges for the year divided by the count of full care dialysis treatments. The estimate for each provider was the average across all patients who fit within some overall guidelines.

In the 1982 period, physicians could be compensated by HCFA for outpatient dialysis in one of two methods. The first was the "initial method" wherein the supervision fee was included with the payment for the outpatient dialysis. Under this method the official fee for the physician was $12 per treatment and consequently the actual payment for dialysis was based on an approved charge of $150 (138 +12). Therefore the method of estimation deducted $12 from the average estimated for each patient whose provider was believed to be using the "initial method". The second method of physician compensation was called the "alternate method" and under this option the physician payment was paid in the usual Part B process for physician payment and was not involved in the payment for outpatient dialysis.

To test the accuracy of the process two tests were used. First, the rate estimated with this process for the free standing units was compared with the official rate of $138. Second the rate derived with this process for the hospital units was compared to the rate published for hospital units at the time of the initiation of the Composite Rate ($159).

The full list of exclusion criteria for patients and their approved charges is presented in Table 1.

RESULTS

The first estimation process worked with a sample of patients. The results of this process are shown in Table 2. The estimates for the freestanding units were approximately 136 or $2 below the official $138. The rate for the hospital units was $150 or $9 below the "semiofficial" rate.

The results by provider are presented in Table 3. The overall rate for the freestanding units was $136.20 or within one percent of the official $138. The rate estimated differed by whether the unit was on the alternate or the initial method of physician compensation.

The overall rate estimated for the hospital units was $148.34 or 93 percent of the "semiofficial" rate of $159. Again the rate differed by whether the unit was on the initial or alternate method.

The estimated rates for 1982 and 1983 are brought together in Table 4. For the freestanding units the official rate of $138 is used in 1982. For the hospital units the estimated rate is used. The official rates for 1983 are also used. The results show that on average the freestanding units had a reduction of -$12.26 or 9 percent. For the hospital units, the reduction was -$18.34 or 12 percent. Overall the rate reduction was -$15.00 or just over 10 percent.

DISCUSSION

The rate reduction in 1983 for outpatient maintenance dialysis was on the order 10 to 11 percent or $15.00 based on this estimation procedure. It varied considerably from hospital to hospital and some units actually had an increase of the order of $22 per treatment. Some hospital units had a decrease of $120 per treatment. Some 59 freestanding units did not have a change. The largest reduction for the freestanding units was -$20.

The estimated rate for hospital units in 1982 was lower than the "semi-official" rate of $159 by 7 percent. How to explain this difference is not known at this time. Possibly the rate of $159 included end of year settlements which are not included in these estimates.

While the actual level of the reduction in payment level for the hospital units may be low it is still presumably correlated with the actual reductions. While this is the best approach that could be used in this analysis future work should consider the potential statistical implications of these potential errors in variables.

Table 1

Parameters for Developing an Outpatient Maintenance Dialysis Price, 1982

Criteria
Excluded Patients Who:
Had more than 1 dialysis provider during year[a]
Had a transplant during year[a]
Had fewer than 365 days at risk for year[a]
Had any home care sessions or charges for home dialysis care[c]
Had any CAPD sessions or charges[c]
Had self-care training or charges[c]
Were not in-center hemodialysis patients[b,c]
Mean approved charge/dialysis session LT $110[c]
Freestanding units (mean approved charge/dialysis session GT $170)[c]
Hospital units (two separate upper limits of $200 and $250 per session)[c]

a. ESRD PMMIS data
b. Full-care sessions = hemo dialysis sessions.
c. Original bills

Table 2

Sample Means for Outpatient Dialysis, "Estimated" Approved Charges 1982[a]

		Patients	
		Method of Physician Reimbursement	
Unit Type		Initial (less $12)	Alternate
Freestanding	Mean	134	136
	n (patients)	271	1,762
Hospital Units			
($200 cap)	Mean	144	153
	n (patients)	285	615
($250 cap)	Mean	154	158
	n (patients)	320	673

a. Estimating done on a sample of records.

Table 3

"Estimated" 1982 Dialysis Approved Charge, By ESRD Unit

Unit Type		Method of Physician Reimbursement		
		Initial (less $12)	Alternate	Mean
Freestanding	Mean	$129.80	$137.60	$136.23
	Min.	116.91	127.18	
	Max.	157.44	158.67	
	CV	6.24%	2.13%	
	n	89	418	
Hospital	Mean	$143.53	$150.18	$148.34
	Min.	110.00	114.12	
($250 cap)	Max.	241.50	248.61	
	CV	16.35%	15.68%	
	n	142	371	

CV is the coefficient of variation. Estimates exclude any end of year settlements.

Table 4

"Estimated" 1982 and 1983 Composite Rate Outpatient Dialysis by Type of Unit[a]

	Means		
Type of Unit	1982 Approved Charge	1983 Composite Rate	Reduction 1983-1982
Free Standing	\$138[b]	\$126	-\$12.26
Hospital	"\$148"[c]	\$130	-\$18.34
Total	\$143[c]	\$128	-\$15.00

a. Weights used to obtain total were the 1980 and 1985 patient weights respectively.

b. Ignores 2 units that had an exception, one higher and one lower than screen.

c. Estimated; is lower than the estimate used by HCFA in issuing the composite rate. Actual may have been \$11 higher.

Table 5

Distribution of Change In Outpatient Dialysis Rate (1983-1982[a])

Type of Unit	Method of Phys. Compensation 1982	Mean (s.d.) n	Minimum Maximum	Units with No change
Free Standing	Initial	-$10.71 ($ 7.18) 87	-$ 20.04 0.00	11
	Alternate	-$12.58 (7.09) 415	-$ 20.09 0.00	48
Hospital[b]	Initial	-$12.80 (22.16) 126	-$105.84 19.04	1
	Alternate	-$20.38 (23.38) 343	-$119.90 21.80	9

a. Two free standing units that had exceptions in 1983 before the composite rate have been set to 138.

b. 1984 rate was known with reasonable certainty. 1983 rate was estimated.

Attachments

1. Survival Analysis of Patients Undergoing Dialysis. JAMA, February 6, 1987.
2. The End Stage Renal Disease Program: Here are Some of the Data. JAMA, February 6, 1987. Editorial by Christopher R. Blagg, M.D.
3. Survey and Reimbursement Information on Dialysis Units and Patients.
4. Competition and Efficiency in the End State Renal Disease Program. JHE 2 (1983).
5. Savings From Home Dialysis: Far Less Than Expected.
6. Provider-Patient Relations and Treatment Choice in the Era of Fiscal Incentives: The Case of the End-stage Renal Disease Program. The Milbank Quarterly, Vol. 65, No. 2, 1987.

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Survival Analysis of Patients Undergoing Dialysis

Philip J. Held, PhD; Mark V. Pauly, PhD; Louis Diamond, MD

We analyzed the five-year survival of 4661 patients with end-stage renal disease whose first dialysis occurred in 1977. The analysis incorporated characteristics of patients and dialysis institutions. Results showed that mortality was positively correlated with patient age, initial conditions leading to renal failure, being male and white, open staffing, and the number of staff physicians. In addition, lower death rates were observed for patients treated in larger dialysis units and units that had been long-term reusers of dialyzers. Patients treated in for-profit and not-for-profit units appeared to have the same mortality, although patients treated in freestanding units had lower mortality. The direction of causation was not always clear in these results.

(*JAMA* 1987;257:645-650)

MORE than 78 483 patients of all ages undergoing dialysis were covered by Medicare's end-stage renal disease (ESRD) program in 1984. The annual cost of the program was approximately $1.8 billion.[1]

The predominant form of therapy for chronic renal failure is dialysis, a periodic process of cleaning the blood either with an artificial kidney or with dialysate that operates across the peritoneal membrane. We performed a cross-institution analysis of survival, incorporating attributes of both the patient (eg, age, sex, race, and diagnoses) and the patient's dialysis unit (eg, profit status, type, and size).[2]

For editorial comment see p 662.

PATIENTS AND METHODS

Our analysis was based on the time, in days, to death or the end of the observation period for 4661 patients with ESRD (12 941 patient-years) over 20 years of age in 1977, the year of their first dialysis treatment. The period of observation was approximately 4.5 years, ie, from first dialysis in 1977 through Dec 31, 1981, at which time 39.6% were still alive. We used the Cox proportional hazards model, which fits survival data using maximum-likelihood techniques.[3]

Sources of Data

Comprehensive patient-specific data files incorporating detailed information regarding cost and survival in Medicare's ESRD program were developed and integrated.[4,5] The data for patient diagnostic characteristics were obtained from all the medical claims and patient history forms filed with the Health Care Financing Administration (HCFA), US Department of Health and Human Services, on behalf of patients with ESRD for the period from 1977 through 1981.[5] The 1982 ESRD Medical Information System was compiled from HCFA forms numbered 2742 and 2728-U4; this system contains biographic and diagnostic patient medical history data for all patients who were alive after 1976, including patient characteristics (age, race, sex, and date of birth), primary and secondary diagnoses leading to renal failure, the date of first dialysis, and information on kidney transplant incidence.

We collected additional primary data for 654 dialysis and transplant units in 1982. These data were derived from the Survey of Dialysis Institutions (SODI) and included information regarding physician financial incentives, services offered to patients, policy on open vs closed physician staffing, and the reuse of dialyzers.[5] More details on this survey can be found in the National Auxilliary Publication Service (NAPS) (document 4451).

Demographic and economic statistics (eg, average family income, wage levels, and population concentration) in the geographic area of each patient's coordinating dialysis unit (CDU) were collected from published sources, primarily the US Census.[6-9] The CDU was the dialysis or transplant unit that provided the patient with the most dialysis treatments.

Sample Selection and Analysis

Sampled patients had to have initiated dialysis in 1977; be eligible for Medicare insurance coverage; be older than 19 years of age at the time of first dialysis; survive at least 90 days from first dialysis; not receive a kidney transplant between 1977 and 1981; and have received 85% or more of their dialysis treatments from their CDU. In addition, the patient's CDU had to have been one of the 654 dialysis (or transplant) units completing the SODI.

Restricting the sample to new dialysis patients in 1977 ensured homogeneity in terms of what might be called the "vintage effect." Vintage effects are changes in technology or procedures over time that affect outcomes. For example, improvements in technique might imply different mortality for a cohort from 1973 than for a cohort from 1980. Patients less than 20 years of age were excluded because of their small number and the possibility that they were not similar to the rest of the population. New patients with ESRD less than 65 years of age had a 90-day waiting period before Medicare eligibility began. Patients less than 65 years of age who died during the first 90 days would not be included in the Medicare files, while patients over 65 years old who died would be included. Excluding all patients from the analysis who died in the first 90 days removes this potential source of bias.

Transplant recipients were excluded to keep the analysis straightforward and interpretable. A major focus of this study was the impact of the characteris-

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Opinions and conclusions are those of the authors and do not necessarily represent the views of The Urban Institute or its sponsors

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Table 1.—Estimated Relative Risk of Death by Classification of Diagnoses at Time of First Dialysis

Disease Group	Description	Relative Risk of Death* (*P*)	Primary Disease	Complicating Conditions
HH	*High*-risk primary disease with *high*-, *intermediate*-, or *low*-risk, or *no complicating* conditions	2.61 (<.00)	Diabetes	Any or none (ie, all patients with diabetes regardless of complicating condition status)
IH	*Intermediate*-risk primary disease with ≥1 *high*-risk complicating condition	1.51 (<.00)	Hypertension	≥1 of following: heart disease, diabetes, pulmonary disease
LH	*Low*-risk primary disease with ≥1 *high*-risk complicating condition	1.40 (<.00)	Other, including glomerulonephritis, polycystic kidney, and collagen	≥1 of following: heart disease, diabetes, uncontrolled hypertension, pulmonary disease
IILON	*Intermediate*-risk primary disease with *intermediate*-risk, low-risk, or *no* complicating conditions	1.20 (<.07)	Hypertension	Malignant neoplasm or other (than those listed above) or none
LON	*Low*-risk primary disease with other *low*-risk or *no* complicating conditions	. . .†	Other including glomerulonephritis, polycystic kidney, and collagen	Other (than those listed above) or none

*With other covariates held constant.
†Reference group.

Table 2.—Relative Risk of Death of Dialysis Patients and Patient Characteristics (Covariates)

Patient Covariates	Relative Risk of Death*	*P*
Male vs female	1.15	<.00
Black vs white and other races	0.84	<.00
Age, y, vs 40-59 y		
20-39	0.76	<.00
60-69	1.67	<.00
70-79	2.44	<.00
80 –	3.10	<.00

*Other covariates held constant.

Table 3.—Relative Risk of Death for Selected Coordinating Dialysis Unit (CDU) Characteristics

CDU Characteristics	Relative Risk of Death*	*P*
Freestanding dialysis units vs hospital centers		
For-profit	0.88	<.03
Not-for-profit	0.78	<.00
Large dialysis unit vs small unit (75 vs 25 patients)	0.89	<.00
Reuse of dialyzers vs never reused		
Multiple uses started at or prior to 1980	0.88	<.03
Multiple uses started after 1980	1.01	<.88
Open staffing vs closed staffing	1.20	<.00
>1 medical group practicing in unit vs only 1 group	0.89	<.01
No. of physicians on staff (6 vs 5)	1.02	<.00
Median family income (1979) in county of unit ($22 000 vs $21 000)	1.01	<.34
Concentration of dialysis market† (4 vs 8 dialysis units)	1.03	<.07

*Other covariates held constant.
†A measure of competition.

tics of the CDU; however, the relevance of characteristics of the CDU to the survival analysis of patients who received transplants is unclear. To control for potential bias because of differential transplant rates across CDUs, the proportion of the 1977 cohort who received transplants and the mean days to the first transplant were added as covariates.

The restriction requiring 85% or more of a patient's dialysis treatments to have been provided by his or her CDU ensured that only patients for whom the CDU characteristics were relevant were included in the analysis. The restriction that the patient's CDU had to have completed the SODI survey was imposed because certain provider characteristics were available only from that source. Estimates of the effects of sample exclusion criteria on the analyses are described later and in the NAPS material.

Analysis Methods

We grouped the diagnoses of patients at the time of first dialysis, before the statistical analysis, into a series of five mutually exclusive categories based on the primary and complicating diagnoses leading to renal failure. The designation of primary vs complicating diagnoses was that reported to Medicare.[10]

Cox's proportional hazards model[3,11,12] was estimated with a dependent variable of time to death or censoring, in days, for each patient. The days survived started on the 91st day following first dialysis.

RESULTS

The survival results are presented in relative risk (RR) terms, ie, in terms of the estimated risk of death in any period relative to an arbitrarily chosen reference group, other things equal. That is, all the results presented in this article were determined with the entire vector of patient (eg, sex, race, and diagnoses) and provider (eg, size and ownership) covariates held constant.

The RR of death provides an easily interpreted measure of the impact of a given covariate on mortality. For example, if blacks have an RR of death of 0.84 compared with a reference group of nonblacks, this would indicate that the risk of death for blacks was 84% of the risk for the reference group (nonblacks). The absolute risk of death in a single year for blacks could be computed by multiplying the RR by the absolute risk.

While all of our results are presented in terms of RR of death, a sense of the absolute magnitudes implied by these estimates is useful. The annual death rate varied by age group from 12.7% for the youngest patients (20 to 44 years of age) to 34.1% for the oldest (65 years old and older).

Initial Diagnoses, Race, Sex, and Age

Table 1 gives the RRs for five aggregations of diagnoses leading to renal failure, compared with a reference group of low-risk primary disease with low-risk or no-risk complicating conditions (LON in Table 1). The most pronounced effect was that for class HH (high risk), which included all patients whose primary diagnosis was diabetes and had an RR of 2.61 (261% of the risk of death of the LON reference group). For the other classifications, the RRs declined from the highest-risk to the lowest-risk classification.

Blacks undergoing dialysis had a lower risk of death (RR, 0.84) than did whites and members of other races (Table 2). Male patients had a higher RR (1.15) than did female patients. Again, all of these estimates of RR were calculated with other covariates, including both patient and dialysis unit characteristics, held constant. Not surprisingly, the risk of death increased with age.

Dialysis Unit Characteristics

Table 3 gives estimated RRs for selected characteristics of the CDU. There are basically four types of dialysis units. The *transplant center* performs kidney transplants as well as a full range of dialysis services (usually including maintenance dialysis) and other renal procedures. *Hospital centers* (the chosen reference group) perform the full range of services except kidney transplants. *Hospital facilities* usually perform only outpatient maintenance dialysis. *Freestanding* units also perform only maintenance dialysis, although they are organizationally independent of a hospital.

Patients whose CDU was a not-for-profit freestanding unit had an RR of

0.78 compared with patients whose CDU was a hospital center. Patients whose CDU was a for-profit freestanding unit had a similar RR, 0.88.

Patients whose CDU was larger had a lower RR than did patients treated in smaller units. For example, a patient whose dialysis unit had 75 patients had 89% the risk of death (Table 3) of patients whose unit had only 25 patients.

Patients whose CDU was a long-term reuser of dialyzers (reuse started before 1980) had an RR of 0.88 ($P<.03$) compared with patients whose CDU never reused dialyzers, other covariates being equal. In patients whose CDUs initiated reuse more recently, mortality risks were not statistically different from those of patients whose CDUs never reused dialyzers.

Patients in CDUs that had open staffing for physicians had higher mortalities (RR, 1.20) than did patients in units with closed staffing. However, this was partially offset by the finding that units with more than one medical *group* of practitioners had an RR of 0.89. Patients in units with more physicians on the staff (other factors, including the size of the unit, held constant) had higher mortality than did patients in units with fewer physicians. An increase of one physician was associated with a 2% increase in RR.

Family income in the county of the CDU was *not* statistically associated with mortality risks. Finally, patients treated in more concentrated markets (ie, dialysis markets where a few CDUs have a greater share of the patients and where competition is likely to be lower) had higher RRs than did patients in less concentrated markets.

It should be stressed that these results were found with 33 covariates held constant. The other covariates held constant, but not presented here, include city size, the local wage rates, and other socioeconomic measures.[13] See NAPS document for more details.

COMMENT

Case Severity Indicators

An RR of 2.61 is a good indication of the high mortality associated with ESRD in a patient who is also diabetic. Unfortunately, data restrictions precluded distinguishing between type 1 and type 2 diabetics. The classification of collagen disease in the low-risk primary disease group is likely to be more controversial. The natural history of systemic lupus erythematosus as patients develop renal failure and the morbidity and mortality of patients with ESRD remains uncertain. There is evidence that "activity" does diminish and the disease burns out as uremia supervenes.[14-16] The long-term clinical course of systemic lupus erythematosus in patients receiving long-term dialysis and after renal transplantation appears favorable.[17,18] However, given the extremely low frequency of collagen disease in patients with renal disease (approximately 1.2% in this sample), it is unlikely that their classification in other categories would materially affect the overall results.

The results for race and sex (Table 2) showed that female patients and blacks had lower mortality than did male patients and whites. Other analyses (see NAPS document) showed that when race and sex were estimated with cross-effects, eg, black male patients vs black female patients, the results were similar to those of the above analyses.

Profit Status and Type of Dialysis Unit

The results showed that patients whose CDU was a freestanding unit, either for-profit or nonprofit, had lower mortality (RR, 0.88 and 0.78, respectively) than did patients whose CDU was a hospital center. The difference between the for-profit and not-for-profit freestanding units was not statistically different ($P<.25$).

The indistinguishable difference between for-profit and not-for-profit freestanding units bears on the discussions that ensued from the results of a mortality study of patients with ESRD in Michigan.[2] In that study, Plough et al reported that patients treated in for-profit units had lower mortality than patients treated in not-for-profit units. They believed the reason for this finding was a less complicated case-mix in the for-profit units. Our results suggest that lower mortality may be associated with all freestanding units and that profit status is not an important distinction in this matter. Plough et al could not detect this association because there were no not-for-profit freestanding units in their analysis, ie, they interpreted for-profit to mean freestanding. In our analysis we separated these issues.

Size of Dialysis Unit

Lower mortality in larger dialysis units than in smaller units is certainly a plausible result given the frequently observed relationship between size and outcomes, in selected surgical procedures as well as in many other activities of a modern society.[19] A recent article by Neu and Kjellstrand[20] on voluntary cessation of dialysis suggested that the staffs of larger dialysis units may be less likely to encourage patients to cease dialysis or that patients of these units may be less likely to choose to cease dialysis. Such a situation would, for example, lead to lower mortality in the larger units. However, the presence of other covariates, such as age (which Neu and Kjellstrand did associate with cessation) and the magnitude of the differences, suggests that this hypothesis is unlikely to account for all the difference in the RR associated with size. Similarly, it should be noted that the lower mortality estimates for blacks were determined with dialysis unit size and other covariates held constant. Finally, although for-profit units do tend to be larger than average, the size effect estimated above holds true, *given for-profit status*.

Reuse of Dialyzers

Reuse of dialyzers is currently one of the most controversial issues in the ESRD community. Consequently, our finding of lower mortality for patients treated in units that were long-term reusers deserves discussion. The analysis gave special attention to long-term reusers—units that initiated reuse prior to 1980. More recent reusers started the process in 1980 or thereafter. Unfortunately, it was not possible to identify precisely the exact year that reuse began for the CDUs that were long-term reusers. Patients whose CDUs were long-term reusers accounted for 21% of the sample; short-term reuse applied to 24% of the sample; and 55% of the sample had CDUs that did not reuse dialyzers.

Reuse of Dialyzers in the Current Analysis.—Our results clearly suggest that patients whose CDUs were long-term reusers had lower mortality than patients whose CDU did not reuse dialyzers. This result is plausible on the basis of theory and other empirical analyses. A potential problem with this interpretation of the empirical findings, however, is that long-term reuse of dialysis units *may* give a better outcome not only because of reuse but because of better quality along dimensions that were not controlled for in this analysis. If this were the case, then the long-term reuse measure would be merely an indicator of the generally higher quality of these CDUs. We cannot confirm or deny this hypothesis given the currently available data. Another possible hypothesis is that reuse correlates with a healthier, less complicated patient mix. This would suggest that healthier patients are more likely to choose or be forwarded to units that reuse dialyzers. Similarly, it could be argued that a unit may decide to reuse dialyzers because its patient mix is less complicated than average.

These hypotheses, although possible,

seem implausible. There are no theories to suggest, nor does the literature support, this reverse-causation argument, ie, that a low-mortality patient mix causes a higher probability of reuse. Since our analysis controlled for some measures of case-mix, any complications affecting reuse policy must therefore go beyond those measures used in this analysis. It can be argued that case-mix is likely to be more complicated in *unmeasured* dimensions if it is found to be more complicated in *measured* dimensions. To test this hypothesis, we performed a secondary analysis of the statistical relationship between the available case-mix measures and a dialysis unit's policy on reuse of dialyzers.

A multiple linear regression of long-term dialyzer reuse on the diagnostic groupings (Table 1) did not support the hypothesis that low expected mortality causes reuse rather than vice versa. Only one of the coefficients (low-risk primary condition and high-risk complicating condition [LH in Table 1]) was positive and statistically significant ($P<.01$). Neither of the two higher-risk groups (HH or IH in Table 1) were statistically significant in the regression, nor were any of the age binaries associated with long-term reuse. A further test of the relationship of case-mix to reuse was performed by reestimating the Cox analysis for patients of freestanding units only. This sample restriction should ensure a more homogenous case mix. The effect of long-term reuse was similar (RR, 0.89). In sum, the hypothesis that lower-risk patient selection leads to reuse of dialyzers has little statistical support.

Patients treated in CDUs that were short-term reusers did not have mortality different from that of patients whose CDUs never reused dialyzers. This result could be expected, since a large fraction of this 1977 cohort would have died before reuse was initiated.

To investigate whether a similar argument applied to the patients of units that were long-term reusers, the Cox analysis was repeated on the same cohort of patients but restricted to patients who survived through Jan 1, 1979. In other words, the analysis was rerun for comparable cohorts for which one could reasonably infer that a large subsample was subjected to reused dialyzers. A mortality pattern similar to that reported for the entire sample was found for this subsample (RR, 0.83; $P<.02$).

Additional Background on Dialyzer Reuse.—Normally, the alternative hypothesis to lower mortality with reuse of dialyzers is that reuse is no worse for mortality. In other words, even if the notion of lower mortality with reuse is not accepted, our results clearly did not suggest worse mortality. This is in itself a major finding.

In addition, there are theories and empirical evidence to suggest that mortality may not be worse, or that lower mortality may result, from reuse of dialyzers. For example, hemodialyzers have been reused for over 20 years. Most findings do not suggest adverse outcomes of this medical practice. Intradialytic symptoms reportedly are less frequent in patients treated with reused dialyzers than in patients not receiving reused dialyzers.[21-23] Other studies have reported that mortality and the rate of hospitalization are not adversely affected by reuse[24] and that the cost of inpatient care per time at risk is not increased.[5] In addition, Wing et al[25] reported no long-term adverse effect of reuse on mortality and morbidity.

Various physiologic derangements, such as leukopenia and complement activation, are markedly ameliorated by use of reused hemodialyzers compared with first use.[26-28] Other studies have reported that reuse of dialyzers has resulted in no difference in infection rates between units that reuse dialyzers and units that do not. The rate of hepatitis among patients and staff did not increase,[29] nor did rates of admission to the hospital for infection.[23,24,30]

The most specific evidence regarding adverse effects of the reuse of dialyzers comes from an incident involving 27 patients infected with *Mycobacterium* that originated in the city water supply. Fourteen of the patients died.[31,32] Subsequent analysis by the Centers for Disease Control (Atlanta) led to the hypothesis that the patients became infected through reused dialyzers. However, "the extent to which bacterial contamination contributed to their deaths is unknown; an autopsy was performed on only one of the 14 patients who died."[31] Supporters of reuse argue that this was a case of contaminated water and improper reuse techniques.

The opponents of reuse of dialyzers have focused primarily on the use of formaldehyde, the primary disinfectant currently employed for reprocessing of dialyzers. Formaldehyde is a local irritant but, when administered systemically, by intravenous injection or inhalation, may be rapidly metabolized.[32] Some critics have argued that residual formaldehyde in reused dialyzers has adverse effects. For example, formaldehyde reportedly causes toxic effects by its ability to react to and alter proteins, rendering them immunogenic so that autoantibodies are raised against them. This may result in hemolysis and disturbances in platelet function and clotting mechanisms.[33] Opponents of reuse have argued that these results may lead to higher sensitization and lower success rates in transplantation,[34] although there is little empirical evidence to support these notions. Others have found that development of anti-N-like antibodies can occur without reused dialyzers, possibly as a consequence of shipping and sterilizing new dialyzers with formaldehyde.[35] The supporters of reuse argue that proper rinsing can eliminate these potential problems and that these results were from earlier periods of reuse with less sensitive tests to measure residual formaldehyde than are now being used.

With regard to the potential teratogenic effect of formaldehyde, a study conducted under the auspices of the National Cancer Institute (Bethesda, Md) failed to confirm an adverse impact of formaldehyde exposure, studying 26 000 persons involving over 600 000 person-years of follow-up observation.[36] However, opponents of reuse argue that this study considered atmospheric exposure to formaldehyde, which they argue may be quite different from systemic infusion over a long period.

Opponents of reuse argue that the analysis so far has been too short. However, they have not provided empirical evidence for their concern that, over the long term, formaldehyde in reused dialyzers may lead to a higher incidence of chemical carcinogenesis. Rather, the opponents have taken a view that the burden of proof lies with the advocates of reuse, ie, that reuse of dialyzers should be proven safe over a long term before implementation.

The empirical results of our study, as they relate to dialyzer reuse, strictly focus on mortality. Our findings have no bearing on other concerns of reuse, which may include more acute short-term morbidity, such as possible excessive heparinization causing nosebleeding and bleeding at needle sites after dialysis. Moreover, the favorable findings of this study regarding mortality and dialyzer reuse pertained to patients whose CDUs were long-term reusers and do not apply to units that adopted reuse more recently. Finally, it should be noted that the estimated coefficient for long-term reuse was robust. Alternative specifications and sample selection had no material effects on the estimates.

Open Staffing and Staff Size

Three results deserving discussion are the mortality implications associated with the size and type of the physician staff. First, open staffing and larger physician staffs (other covariates including CDU size held constant) suggest a higher mortality. Again, the direction of causation is questionable. For example, does open staffing cause higher mortality or do patients with higher predisposition risk factors somehow become patients in the open-staffed dialysis units? Again, it may be impossible to resolve this issue with the current data. The main argument that could be made for the reverse causation is that open staffing is more likely to be used in a dialysis unit that wants to recruit additional patients, and physicians (via an open staff) are the main source of patients. For the argument to be valid, it would also have to follow that an open-staff policy will lead to selection of higher-risk patients. Multiple linear regression was again used to test the hypothesis of an association between open staffing and five measures of diagnostic risk and the five age groups. The results did not support this hypothesis. Only the diagnosis group LH (see Table 1) was positive ($P<.01$). Other research has shown open staffing to be associated with higher outpatient costs, but not with higher inpatient costs.[5] This could also be seen as evidence against the hypothesis of open staffing being associated with higher-risk patients (see NAPS document).

Is there, however, a plausible explanation to support the finding of higher mortality and open staffing? Such an argument would go as follows: Open staffing makes management and quality control more difficult; procedures are less standardized; there are more physicians giving directions to staff, etc, and this could conceivably lead to higher mortality.

It should be noted that even if open staffing is causally linked to higher mortality, there may be other issues to consider before concluding that open staffing is a wrong choice. For example, it can be argued that open staffing increases patient and physician choice, which may have benefits for patients.

The association of larger physician staffs with higher mortality is another result for which reverse causation should be considered as a possible explanation. For example, if units with large physician staffs are also the main referral centers for complicated cases, then reverse causation may be the case. But before this notion is accepted, it should be noted that several covariates (eg, transplant centers) included in the Cox analysis should, at least partially, capture effects associated with referral centers. Furthermore, a Cox analysis for patients of freestanding units only showed results similar to those of the whole sample (RR, 1.02; $P<.10$). This could also be seen as evidence against the reverse causation hypothesis.

The finding of lower mortality with more than one *group* of physicians in the unit is perplexing given the foregoing discussion on open staffing and size of the physician staff. It could be conjectured that having more than one group would have effects in the same direction as the other two covariates. However, the magnitude of the effect of more than one group is just over half that for open staffing (11% vs 20%). In addition, alternative specifications and tests indicated that the open staffing effect was strong and was not a statistical consequence of correlation among covariates (see NAPS document).

Family Income and Dialysis Market Concentration

The lack of a statistical association between family income and mortality suggests that federal funding for treatment of patients with ESRD has been effective in providing equal treatment of the rich and the poor. While median income in the county of the CDU is the best measure available in the current analysis, future analyses should focus on individual patient income, which could conceivably show different results.

Previous research has shown that more competition for patients in dialysis markets (lower market concentration) is associated with lower CDU profits and more amenities for patients.[27] The finding that RR may also be lower in more competitive markets suggests an additional benefit of competition. The lower than usual criteria ($P<.07$) for the parameter and the possibly small estimated impact suggest a need for further analysis. Since the concentration measure is sensitive to the initial number of CDUs, alternative market sizes could have larger effects.

Home Dialysis and Peritoneal Dialysis

We attempted to measure the effect of reasonably predetermined measures on patient mortality. The estimated effects of age and sex, for example, are likely to be real and not affected by reverse causation. Other measures, such as open staffing and reused dialyzers, are more equivocal. However, some measures are clearly not exogenous and are likely to reflect reverse or simultaneous causation. Two patient characteristics that fit this description and that attract considerable policy interest are home dialysis (lower-risk selection) and peritoneal dialysis (higher-risk selection)[28] (see NAPS document).

Generalization of Results

With the exception of patients less than 20 years of age, tests were made for the effects of sample exclusion criteria on the results. All but one of the tests showed no effect of sample selection on generalization of results. The exception was that patients excluded because they received less than 85% of their dialysis treatments from their CDU had lower mortality than the sample analyzed in this report. Exclusion of transplant recipients did not affect the results, nor did exclusion by the requirement that a patient's CDU be in the SODI (see NAPS document).

CONCLUSIONS

What can be said about all of these results? Have we been too cautious in the interpretation? Is this exercise worth the trouble? We think so, because most of the issues raised have not been researched before. If nothing else, these results show that for effective research in this area, in both patient and dialysis unit characteristics, there is a need for more detailed understanding of the process and the data necessary to support empirical analysis.

Consider the case of patient severity measures. Although we used extensive data that are usually associated with mortality, there are still some deficiencies in these measures. Age, race, and sex are easy to measure and are useful predictors of mortality, but these indicators are far from perfect. These diagnostic aggregations are reasonably predictive, but there is likely to be substantial unmeasured severity within these diagnostic cells. For example, the range of health status for white men 45 to 60 years of age with renal failure caused by hypertension can be large. Consequently, more precise severity measures will have to wait for better specification and data collection. The data from the HCFA used in this report are the best and only wide-scale data available for the ESRD population in the United States. However, these data are not perfect, and more work including basic design of patient severity measures is needed.

Finally, it should be noted that the results of this analysis bear on several controversial issues that are currently in the public policy arena. While the results were generally robust and most alternative hypotheses were found lacking, the issues are too important to consider settled. At the least, these analyses need to be replicated; ideally they should be extended.

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Editorial

The End-Stage Renal Disease Program: Here Are Some of the Data

Some 13 years ago, implementation of the Medicare End-Stage Renal Disease (ESRD) Program provided access to long-term dialysis and kidney transplantation for almost all patients in need in the United States. Since then the number of dialysis patients in this country has increased from 12 000 to more than 80 000, and some 8000 kidney transplants were done last year. The annual cost of this program to Medicare is approaching $2 billion, and there are also significant expenditures from private insurance, Medicaid, various state funds, and from patients themselves. In 1973 the National Institutes of Health (NIH), the American College of Surgeons, and the Research Triangle Institute were responsible for successful transplant and dialysis registries, but in 1974 these were replaced by the ESRD Medical Information System, which was the responsibility of the Health Care Financing Administration (HCFA). The history of this registry has been an ongoing catalog of misfortune,[1,2] so much so that in 1981 Rennie,[3] in an editorial in the *New England Journal of Medicine*, asked, "Where are the data?"

See also p 645.

Meanwhile, the European Dialysis and Transplant Association, founded in 1964, quickly established a functioning data system. The number of ESRD patients throughout Europe is comparable with that in the United States, and for the last 22 years the European Dialysis and Transplant Association has run a voluntary registry that includes 85% of all patients treated and that has become a major data source for physicians and politicians in the 32 European countries served by the registry[4] and, because of the lack of a comparable registry in this country, for physicians in the United States. Dr Anthony Wing,[5] who was responsible for the European Dialysis and Transplant Association registry for a number of years, has expressed astonishment at the lack of a comparable US registry, particularly as the HCFA has the advantage that it pays for every procedure carried out on patients, each of whom has a unique Social Security number.

We now have an answer to Rennie's question. Most of the data are already there, in the HCFA computer. Recently, Krakauer[6] was able to utilize these data to show the effectiveness of cyclosporine in kidney transplantation, to make projections about its cost-effectiveness, and to provide information to assist the deliberations of the Transplant Task Force.[7] Now, in this issue of THE JOURNAL, Held and colleagues[8] also show what can be done with the HCFA data. In addition to the usual information on the effects of age, diagnosis, and race on patient survival, available from the European Dialysis and Transplant Association registry and from some individual facilities in the United States, this study looks at issues specific to the US scene. Is there a difference in survival between patients in proprietary and nonproprietary dialysis units? Does unit size affect survival? Does whether a unit is open to all qualified nephrologists or restricted have an effect? And a very topical subject at this time: What is the effect of dialyzer reuse on survival?

Registries are important for their scientific value and also for their usefulness to legislators and agencies at the national and local levels. In the last several years, the safety of dialyzer reuse has become a subject of major controversy.[9] Inadequately carried out, dialyzer reuse carries the potential for infection, and the practice may be associated with unaesthetic-appearing dialyzers. These problems, together with the suggestion that physicians and facilities may be profiting from reuse, have become emotional issues, but of even greater concern should be the question of the long-term safety of this practice. Recently introduced legislation would require the Secretary of Health and Human Services to undertake a further study of reuse (Public Law 99.509, The Omnibus Budget Reconciliation Amendments of 1986), but perhaps this is unnecessary when the study by Held and colleagues shows that in dialysis facilities that have practiced reuse for some years, patient survival is better than in facilities that do not reuse dialyzers.

What is still needed[3] is an organized ESRD patient registry in the United States. Currently, data are collected and validated by the ESRD networks, which are themselves under attack by the federal government. Networks have provided some demographic information by pooling their resources,[10] but they do not have a role in overall management of the data they transmit to the HCFA. The latter has neither the manpower nor the expertise to deal with data in the way that they are handled by the European Dialysis and Transplant Association. These problems, together with concern that the successful National Continuous Ambulatory Peritoneal Dialysis Registry of the NIH will be phased out in the near future, the fact that the Transplant Act of 1984 includes a requirement for a transplant registry, and pressure from the North American Society for Pediatric Nephrology to establish a pediatric ESRD registry, have renewed interest in the establishment of a national ESRD patient registry for the United States. Plans have been developed for this to function under the auspices of the HCFA and the NIH, with the latter responsible for establishing a data coordinating center and appropriate committees to ensure the effectiveness of the proposed registry.[11] The proposed registry has been endorsed by the relevant professional societies, as well as by the Task Force on Organ Transplantation, and is included in legislation passed by the Congress before its recent adjournment.

Unfortunately, though much of the data are in the HCFA computer, access to this is not easy for most of us at present. The proposed national ESRD patient registry would include a mechanism for supervision of the registry; production of regular reports for professionals, administrators, politicians, and patients; and the opportunity to develop data for specific research projects. The extra cost for the essential NIH contribution to the proposed registry has been estimated to be approximately $1.2 million a year, not a great deal in a program that is currently spending almost $2 billion annually. It is to be hoped that at last this country may soon have a functioning registry to answer many of the difficult questions that will arise in the future as progressive cost-containment in the ESRD program affects quality of care.

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SURVEY AND REIMBURSEMENT INFORMATION ON DIALYSIS UNITS AND PATIENTS

Urban Institute Patient Incentive Study

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THE URBAN INSTITUTE
2100 M Street, N.W., Washington, D. C. 20037

Selected Responses from the Survey of Dialysis Patients Conducted by the Urban Institute in 1985

	N	% OF TOTAL
1. How much do you pay, out of pocket, monthly for dialysis-related services?		
Mean Amount is		$53.69
2. In selecting your physician , how important was the following factor? Recommendation of physician or other medical professionals.		
1. Very important	331	63
2. Important	105	20
3. Not important at all	64	12
8. Don't know	29	5
3. In your judgment, do new dialysis patients always, usually, sometimes, rarely, or never have a realistic choice of more then one unit in this area?		
1. Always	147	16
2. Usually	156	17
3. Sometimes	123	13
4. Rarely	128	14
5. Never	148	16
8. Don't know	223	24
4. On a scale of 1 to 5 where 1 represents strongly disagree and 5 represents strongly agree, please rate the following statement. In general, patients and physicians agree on a patient's first choice of a unit.		
1. Strongly disagree	61	7
2.	37	4
3.	215	23
4.	209	23
5. Strongly agree	345	37
8. Don't know	57	6
5. On a scale of 1 to 5 where 1 represents poor and 5 represents excellent, how would you rate your physician?		
1. Poor	10	1
2.	18	2
3.	53	6
4.	195	21
5. Excellent	643	70
8. Don't know	6	1

Selected Responses from the Survey of Dialysis Patients Conducted by the Urban Institute in 1985

	N	% OF TOTAL
6. In what important areas, if any, do you feel your physician could improve?		
1. Be more accessible to patients; have a lighter work load with fewer patients so the doctor has time to listen to the patients; be more helpful and concerned with a patient's emotional side of illness; be more sympathetic; be aware of general problems	133	14
2. Have more concern for patient finances	16	2
3. Provide more information	55	6
4. Have a good schedule; be on time because patients use public transportation and they must leave on time	7	1
5. Have a better bedside manner	7	1
6. Groups of physicians should offer consistent advice—should agree on physical conditions and treatments	5	1
7. None	615	66
8. Don't know	73	8
10. Other	13	1
In choosing a dialysis unit, how important are the following factors?		
7. Offers choices and helps the patient obtain the type of treatment most suitable to their needs.		
1. Very important	669	72
2. Important	212	23
3. Not important at all	19	2
8. Don't know	25	3
8. Unit offers CAPD.		
1. Very important	270	29
2. Important	229	25
3. Not important at all	214	23
8. Don't know	212	23

Selected Responses from the Survey of Dialysis Patients Conducted by the Urban Institute in 1985

	N	% OF TOTAL
In choosing a dialysis unit, continued...		
9. TV for each patient.		
1. Very important	377	41
2. Important	300	32
3. Not important at all	231	25
8. Don't know	17	2
10. Offers an evening shift.		
1. Very important	368	40
2. Important	295	32
3. Not important at all	226	24
8. Don't know	36	4
11. Do you think it is better to reuse dialyzers(kidneys). Or not to reuse them?		
1. Better to reuse	260	28
2. Better not to reuse	320	35
3. Doesn't matter; unit/physician decides	166	18
8. Don't know	179	19
On a scale of 1 to 5 where 1 represents strongly disagree and 5 represents strongly agree, please rate the following statements:		
12. The staff at my dialysis unit is a high quality staff.		
1. Strongly disagree	11	1
2.	9	1
3.	72	8
4.	163	18
5. Strongly agree	669	72
13. The staff at my dialysis unit is a very caring staff.		
1. Strongly disagree	13	1
2.	11	1
3.	56	6
4.	131	14
5. Strongly agree	711	77
14. My dialysis unit does not offer convenient scheduling.		
1. Strongly disagree	523	57
2.	161	17
3.	101	11
4.	52	6
5. Strongly agree	81	9

Table 1

Selected Responses from the Survey of Dialysis Patients Conducted by the Urban Institute in 1985

	N	% OF TOTAL
15. Overall, I feel my dialysis unit does an excellent job.		
1. Strongly disagree	10	1
2.	9	1
3.	67	7
4.	146	16
5. Strongly agree	692	75
16. In your continued use of this dialysis unit, which is the more important consideration—your physician at this unit or the administration and staff at this unit?		
1. Physician	177	19
2. Administration and staff	278	30
3. Both equally important	459	50
8. Don't know	11	1
17. Are there any important areas in which you feel your unit could improve?		
1. Yes	242	26
2. No	615	66
8. Don't know	67	7
18. What areas?		
1. Patient would like unit to serve food, snacksthey get hungry during dialysis.	25	10
2. Larger staff; better scheduling; better patient and staff ratio; better trained technicians to operate machines	145	60
3. Bigger unit and more machines	51	21
4. More private areas; noisy	5	2
5. Have later hours or night schedules for people that work	4	2
6. Keep patients from being bored—have tv sets and allow visitors	10	4
7. Help pay for transportation and have better transportation	2	1

Selected Responses from the Survey of Dialysis Patients Conducted by the Urban Institute in 1985

19. On a scale of 1 to 7 where 1 represents completely dissatisfied and 7 represents completely satisfied, which number comes closest to how satisfied or dissatisfied you are with your life as a whole?	N	% OF TOTAL
1. Completely dissatisfied	32	3
2.	34	4
3.	66	7
4.	149	16
5.	234	25
6.	158	17
7. Completely satisfied	246	27
8. Don't know	6	1

Selected Questions from
The Survey of Medical Directors
1984 - 1985. Based on 142 observations.

1. What percent of your time, if any, do you spend treating chronic maintenance dialysis patients as opposed to administrative duties ?

1 - 10 %	3 %
11 - 15 %	5 %
16 - 20 %	11 %
21 - 25 %	10 %
Over 25 %	70 %
Don't know	1 %

2. Assuming that the current reimbursement rate for outpatient dialysis continues, do you want to increase the number of patients being served by this unit ?

Yes	83 %
No	13 %
Don't know	4 %

3. Does your unit have the capacity to comfortably handle more patients ?

Yes	69 %
No	30 %
Don't know	1 %

4. How many more patients does your unit have the capacity to comfortably handle ?

Average number was 29 patients.

5. Do you offer (to patients) transportation services at no or reduced cost to patients ?

Yes	18 %
No	81 %
Don't know	1 %

6. Does your unit currently accept the following types of patients for outpatient maintanance dialysis treatments ?

   a. Patients with hepatitis or who are Australia Antigen Positive ?

Yes	66 %
No	34 %

   b. Blind and insulin-dependent patients ?

Yes	98 %
No	1 %
Don't know	1 %

Selected Questions from
The Survey of Medical Directors
1984 - 1985. Based on 142 observations.

7. Is it the practice of this facility to reuse dialyzers ?

Yes	62 %
No	38 %

8. Is it the practice of the unit to reuse blood line or tubing ?

Yes	17 %
No	82 %
Don't know	1 %

9. How many shifts or groups of patients are currently at capacity ?

All	31 %
Some	58 %
None	10 %
Don't know	1 %

10. How long does it take, on average, for a patient to be scheduled for a shift which is at capacity ?

Average time is 5 weeks.

11. Do you accept patients without any public or private health insurance coverage ?

Yes	69 %
No	25 %
Don't know	6 %

12. How many of you patients currently have no health insurance coverage ?

Average number was 2.02 patients.

13. How many of these are "zero pay" patients ?

Average number was 1.74 patients.

14. In your judgement, do new dialysis patients always, sometimes, rarely or never have a realistic choice of more than one unit in this area ?

Always	60 %
Sometimes	26 %
Rarely	8 %
Never	2 %
Don't know	4 %

Selected Questions from
The Survey of Medical Directors
1984 - 1985. Based on 142 observations.

15. What if your unit had to close permanently ? How many units could a patient realistically transfer to ?

Average answer was 4 units.

16. Does this unit practice "open staffing?"

Yes	61 %
No	35 %
Don't know	4 %

17. How long has this unit practiced the reuse of dialyzers ?

More than 2 years ago	59 %
The past 2 years	22 %
The past year	17 %
The last 6 months	1 %
Don't know	1 %

18. Does your unit do kinetic modeling for prescribing the length of dialysis treatment ?

Yes	27 %
No	70 %
Don't know	4 %

19. What percent of your revenues currently come from the following sources?

Medicare	75 %
Medicaid	10 %
Private Insurance	10 %
Patient self-pay	3 %
Other	2 %

20. On the scale of 1-5, where 1 represents strongly disagree and 5 represents strongly agree please rate the following statements.

If patients are left to their own devices, they either make decisions or find professional advice which enables then to make choices for their own best welfare.

(1) Strongly Disagree	8 %
(2)	23 %
(3)	38 %
(4)	16 %
(5) Strongly agree	12 %
Refuse	4 %

Selected Questions from
The Survey of Medical Directors
1984 - 1985. Based on 142 observations.

20. On the scale of 1-5 ...(cont.)

I believe that patients should share in savings which result from their choices of a less expensive dialysis unit.

(1) Strongly Disagree	38 %
(2)	15 %
(3)	14 %
(4)	18 %
(5) Strongly agree	6 %
Refuse	6 %

Selected Questions from
The Survey of Nephrologists.
1984 - 1985. Based on 91 observations.

1. What percent of your time in the last year was spent treating End Stage Renal Disease (ESRD) patients versus other kidney and medical problems ?

1 - 10 %	2 %
11 - 20 %	9 %
21 - 40 %	12 %
41 - 60 %	36 %
61 - 80 %	25 %
81 % or more	14 %
Don't know	1 %

2. What is the number of units where you have admitting privileges ?

One	27 %
Two	24 %
Three	10 %
Four	18 %
Five	9 %
Six	11 %
Don't know	1 %

3. Would you like to have admitting privileges in more units than you currently have ?

Yes	14 %
No	86 %

4. On a scale of 1 to 5, where 1 represents strongly disaggree and 5 represents strongly agree, please rate the following statement.

In the immediate area, new nephroogists can obtain staff privileges at existing units.

1. (Strongly disagree)	14 %
2. ...	8 %
3. ...	12 %
4. ...	14 %
5. (Strongly agree)	49 %
Don't know	2 %

5. Overall, would you say you want to increase or decrease the number of patients you are currently treating ?

Increase	70 %
Decrease	2 %
Neither increase or decrease	24 %
Don't know	2 %
Refuse	2 %

6. How many more ESRD patients would you like to increase your practice by ?

The average answer was 34 patients.

Selected Questions from
The Survey of Nephrologists.
1984 - 1985. Based on 91 observations.

7. In deciding where to admit patients, how important is the additional fact of free or reduced costs of tranportation for patients ?

Very important	29 %
Important	53 %
Not at all important	16 %
Don't know	1 %
Refuse	1 %

8. Assuming you could have the same type of compensation and sheduling and could have admitting privileges in another unit close to the one where you are now practicing, if three of your patients chose the other unit, would you go there to practice ?

Yes	52 %
Noree	37 %
Don't know	11 %

9. If patients are left on their own devices, they either make decisions or find advice which enables them to make choices for their own best welfare ?

1. (Strongly disagree)	7 %
2. ...	20 %
3. ...	34 %
4. ...	21 %
5. (Strongly agree)	16 %
Don't know	2 %

10. I believe the patients should share in savings which results from their choice of a less expensive dialysis unit.

1. (Strongly disagree)	38 %
2. ...	14 %
2. ...	16 %
4. ...	12 %
5. (Strongly agree)	13 %
Don't know	5 %

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COMPETITION AND EFFICIENCY IN THE END STAGE RENAL DISEASE PROGRAM*

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Estimated coefficients for medical service production or cost functions are subject to a 'competitive amenity bias' which may result in the failure to identify factors that affect economic efficiency. Our investigation of productivity of dialysis facilities did indeed indicate both the likelihood of bias and some qualitative results. These results suggest that it will be difficult to estimate cost and that variation in the level of reimbursement will, in competitive markets, affect the level of amenity delivered to patients. Incurred cost, amenity, and patient well-being will all vary positively with the reimbursement level. Determining the 'right' level of reimbursement requires a policy decision on how much total amenity society wishes to deliver to beneficiaries of public programs.

1. Introduction[1]

Governments typically provide a wide variety of programs promising benefits in kind to their citizens. Housing, food, education, and medical care are provided (to varying extents) through public funds in almost all countries. Oftentimes these services are produced by private entities, either for profit or not-for-profit, which are not under direct public control but are reimbursed by government for services provided. There has been increasing pressure on public officials to find ways of reducing or at least containing the costs of producing these services.

Such pressures will naturally lead public officials to search for ways to

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[1] An earlier version of this paper, which analyzed only data from non-hospital dialysis facilities, was presented at the Pinhas Sapir Center for Development Conference on 'Social Policy Evaluation: Health, Education, and Welfare' and is to be published in the conference proceedings as 'Charging the Victim: An Evaluation of Reimbursement Policy in The End Stage Renal Disease Program' in Helpman et al. (forthcoming).

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reduce costs somehow inducing greater efficiency in the production of such services. One common candidate method is to try to alter the level and or method of reimbursement of providers of services. In particular, it is often alleged that efficiency could be improved and the transfer from taxpayer budgets to provider profits could be reduced if reimbursement were set equal to what costs would be for an average or even more efficient than average institution. The average costs would be discovered by statistical or accounting approaches and would be adjusted for differences in output mix and input prices. For example, Victor Fuchs has proposed that hospitals be reimbursed by establishing 'the reimbursement rate for each hospital ... as a function of the average cost of all hospitals combined, adjusted for the characteristics of the particular hospital. Thus hospitals located in higher wage areas or those offering more services would get above-average reimbursement; those in low-wage areas or those offering fewer services would get less' [Fuchs (1974, pp. 100–101)].

In this paper we argue that such a procedure of searching for 'the' cost to which reimbursement is to be equated is misdirected if not futile. Analyses of costs and productivity are useful but not conclusive in determining ideal reimbursement policy. Analysis can help to determine which qualitative variables are relevant in determining reimbursement, but analysis of costs alone cannot determine what the ideal reimbursement level ought to be.

The problem is that at any given reimbursement level, competition among providers may itself be expected to affect the level of amenity (medical and non-medical) and therefore the level of cost [Joskow (1980)]. Hence, there is no single knowable and determinate level of cost to which reimbursement can be related; nor can data on current costs determine what reimbursement ought to be. Instead (as has been noted in an analysis of the airline industry) costs do not determine reimbursement, but rather reimbursement (and competition) determine cost [Douglas and Miller (1974)].

In this paper we present the results of an investigation of a situation in which reimbursement affects product characteristics and costs: the Medicare program for persons with end stage renal (kidney) failure. Medicare provides tax-financed public insurance coverage for the great bulk of medical expenses for nearly all persons with end stage renal disease (ESRD). The purpose of this study is to analyze the impact of some potential or proposed changes in the program's reimbursement structure on the costs paid by the public insurance and on the benefits provided to ESRD patients.

We focus on the impact of the presence or absence of competition. We first present a simple model to show that the level of amenity can be affected by the level of reimbursement and the level of competition. We then argue that this amenity bias can affect estimates of costs, cost functions, and production functions. We next present empirical evidence to show that this is more than theoretical speculation. With output price approximately fixed, we find that profits from dialysis services are indeed affected by the degree of competition. Competition is also shown to be positively related to an observable measure of the level of amenity. Finally, we illustrate the implications of this competition-amenity interaction on estimating and interpreting a production function for this type of health care. We indicate that such estimates are subject to a previously unrecognized 'unobserved amenity bias'.

2. The ESRD program

Persons with the end stage renal disease are eligible for the government-provided Medicare insurance in the United States. Approximately 90 percent of all persons with ESRD are covered by this insurance without regard to age or income. The most frequent medical service for such patients is routine maintenance hemodialysis, a thrice weekly session of three to five hours during which the patient's blood is passed through an artificial kidney.

Patients can receive their maintenance dialysis treatments at home or in a center or facility, although the majority (89%) receive their treatments away from home. Patients receiving dialysis treatment in a center or facility receive different levels of assistance. A patient might receive only partial assistance and assume some of the responsibilities which would otherwise be provided by an employee of the institution, or employees may provide all services. Almost all (93%) patients receiving care in a center or facility in 1977 were receiving full assistance.

Assistance is provided in three kinds of institutional settings:

Renal Dialysis Centers which are hospital units that provide the full spectrum of diagnostic, therapeutic (including inpatient dialysis), and rehabilitative services except renal transplantation required for the care of ESRD dialysis patients.

Renal Transplant Centers which are hospital units that provide the service of dialysis centers as well as kidney transplant services.

Dialysis Facilities which provide primarily maintenance dialysis services on an outpatient basis. There are two types of dialysis facilities; *hospital* and *non-hospital*. The latter are usually referred to as free-standing dialysis facilities (FSDF) and are the principle focus of this paper.

In terms of numbers, the dialysis facilities (both hospital and free-standing) approved by Medicare to provide dialysis services represent almost half of the total number of institutions, with the free-standing facilities being more than twice as numerous as the hospital facilities.

In most metropolitan areas the patient can seek dialysis at a number of different institutions. However, because the number of dialysis institutions and the number of dialysis stations within such institutions are subject to restraints such as Certificate of Need (CON) based on health planning criteria, the ease of entry and extent of competition differ across otherwise similar areas. In addition, city size is an important determinant of the number of options available to patients, since larger cities will have greater numbers of patients and consequently more facilities to choose from.

This paper will focus primarily on hospital and free-standing dialysis facilities (FSDFs) which provide the routine and maintenance care for over half of all Medicare patients. Such facilities are reimbursed for 80 percent of approved charges by the Medicare program. Generally, facilities are reimbursed on a reasonable charge basis up to a maximum of $138 per treatment (excluding payments to physicians). An exception to the $138 maximum charge can be granted on a cost justification, but most facilities have an approved charge of $138 per dialysis treatment. The physicians who provide care to ESRD patients can elect to be paid on one of two bases. They can elect to receive a monthly capitation payment to cover all renal-related medical care, or they can elect to receive a fee-for-service reimbursement on a reasonable charge basis for non-routine services. When the latter option is chosen, the per-dialysis maximum charge is increased to $150 to cover physicians' routine treatment of patients during dialysis. In 1978 approximately 45% of all dialysis institutions had elected capitation reimbursement, with this proportion growing over time.[2]

3. Methodological issues

A fundamental characteristic of medical care that makes design of ideal reimbursement policy difficult is the large number of aspects or dimensions of potential reimbursement schemes. The types of provider eligible for reimbursement, the forms of reimbursement (fee-for-service, capitation, or salary), and the variety of provider and service characteristics which might affect the level of reimbursement are nearly unlimited in number.

In the case of the for-profit firms, it is easy to see that any reimbursement scheme that fixes the level of reimbursement independent of the level of cost of inputs (either in total or for particular inputs) offers strong incentives to minimize costs. The current policy of payment of a flat $138 per dialysis is such a scheme. If costs are minimized, it also follows that output is maximized for whatever level of inputs are hired. These incentives to minimize cost are independent of the actual level of reimbursement (i.e., minimization of costs and maximization of output would occur for any level of reimbursement, although the input and output levels would change with the reimbursement rate).

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[2] This description of the payment mechanisms in abbreviated although the basic patterns have been unchanged for the life of the program. At the time of this writing (March 1983), there exist a set of proposed changes to the program administration, including a reduction of the maximum charge and elimination of the fee-for-service option for physicians treating ESRD patients. For some speculation and estimation of the effects of capitation in the ESRD program, see Held and Pauly (1980).

For not-for-profit firms, the level of devotion to cost minimization or output maximization cannot be predicted a priori. Some behavioral models of not-for-profit firms would suggest that not-for-profit firms would tend to convert profits into inputs used to provide income-in-kind or emoluments to managers, rather than dialysis treatments.[3] In the application to dialysis institutions, the tendency to convert profits to income-in-kind would be limited by the fact that many not-for-profit facilities are subdivisions of larger enterprises (i.e., hospitals) so that excess expenditure would be made elsewhere than in the ESRD facility. This tendency would also be affected by competition with for-profit firms which will be discussed in more detail below.

If some or all inputs provide utility in themselves, then a production function for non-profit firms will display lower technical efficiency than one for for-profit firms. In such a case, the firm will not cost minimize.

Adding to cost minimization the objective of limiting rents or profits for providers makes reimbursement policy more complex. The proposition that seems to lie behind much of current incentive reimbursement policy is to try to set reimbursement at approximately the level of cost that would be achieved if production were efficient. A less ambitious but related proposition is that reimbursement should at least vary qualitatively with characteristics that are themselves related to cost. For example, 'incentive reimbursement' schemes which have been suggested for hospital reimbursement either divide hospitals into comparison groups (based on variables presumed to be related to cost) and pay the mean cost of the group, or use the level of cost forecasted from a statistical cost function.

However, the most serious deficiency in an approach such as 'incentive reimbursement' is its failure to control for variation in amenities for patients. There are, in our view, some strong conceptual reasons to suppose that at present some cost variation across ESRD facilities comes not from inefficiency or from observable determinants of cost, but rather from variation in amenities, much of which is unobserved.

There are several kinds of amenities which might be important to ESRD patients. Hours of operation, congestion at peak periods, the availability and type of staff, the level of assistance with the process of dialysis, a policy of not reusing dialyzers, and the provision of transportation are examples of the aspects of care which seem to matter to patients. An amenity which is especially important to the choice of *which* facility to use is location. A firm with many small facilities that are conveniently located will attract a larger market share. (An investigation of exactly which amenities seem to matter to

[3] See Lee (1971, pp. 48–58).

firm-level demand is the subject of our ongoing research.) The critical notion here is that 'amenity' or 'quality' is whatever causes patients to choose one facility over another. To the extent that clinical quality is effectively regulated and kept at higher than profit maximizing levels, amenity competition will not result in greater clinical quality. It is also possible that there will be competition for referring physicians when those physicians are not employees of the dialysis facility. Assistance with the provision of physician services, help in keeping patient records, and attention to feedback on referred patients are all actions which will be costly to the facility but may permit it to attract more business.

With completely free entry into the market and strong competition, all rents are converted into amenities for patients or physicians. In this sense, the idea of objectively determining and then paying 'the cost' of a type of care as an ideal incentive reimbursement is doomed to failure (or at least argument' if applied to services with (sufficiently) variable quality or amenities. The level of reimbursement (unlike Ricardian rent) is not cost-determined; it is cost-determining. In effect, choosing the appropriate level of reimbursement requires more than just determining what costs are or could be; it requires a decision on the level of amenity for the services. Presumably the extent to which rents are converted into amenities depends on the degree of competition.

This is a point of critical importance. Efforts to evaluate reimbursement policy have usually involved trying to determine what 'the cost' is and then comparing that cost with actual reimbursement levels. A large number of studies (especially in connection with hospital reimbursement by diagnostic groups) have tried to do so, often using accounting methods but sometimes employing statistical or econometric approaches. The Health Care Financing Administration has interpreted recent legislation concerning ESRD Reimbursement as a mandate for similar measurements of dialysis facilities. But if there is some competition among physicians and dialysis firms for patients, such measurements will, at best, be of limited value. The observed levels of costs will depend on current levels of reimbursement (as well as on the degree of competition) and would be expected to change if those reimbursement levels were altered. Consequently, current cost data cannot provide a fixed standard of what reimbursement (or cost) ought to be.

4. Theoretical model

We wish to construct a model of the behavior of the for-profit dialysis center which is analogous to the models of airline competition.[4] The behavior of the for-profit facility under reimbursement may be described in the following simple way: suppose the facility has a production function of the form $Q=Q(T,I,Z)$ where Q is the quantity of output, T is a vector of amenities or attributes of output, I is a vector of inputs, and Z is a vector of other facility characteristics. We assume that T is defined such that $\partial Q/\partial T_i$ is less than 0 and the other first derivatives are greater than 0. Inputs are assumed to be available at constant prices P, so the cost function can be written $C=C(Q,P,T,Z)$. [It is assumed that marginal costs of Q and T are positive, and that the cross effects $\partial(\partial C/\partial Q)/\partial T_i$ and $\partial(\partial C/\partial T_i)/\partial Q$ are positive.]

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[4] We cannot use exactly the same models, such as that of Schmalensee (1977, pp. 565–576). Those models assume that each airline's demand depends only on its schedule frequency (number of flights available per day). It is not plausible to assume that all of the relevant

The level of total demand in any market, or $\sum Q$ is fixed, i.e., all patients with renal disease will obtain dialysis. We also assume that given that the facility operates at all, Q is determined, i.e., the facility must produce the number of dialysis treatments demanded from it. However, the facility does face a demand function of the form

$$Q_D=Q(T), \tag{1}$$

where T is, as above, the type or style of output the facility elects to produce.

The insurer's reimbursement policy can be represented by a revenue function for the enterprise of the form

$$R=R(Q,P,T,Z). \tag{2}$$

To supply positive output in the long run, the facility then chooses T (the amenity level) and input combinations to maximize $(R-C)$. It must also satisfy a break even condition $R \geqq C$.

The reimbursement function presently used by the government insurer is quite simple. For most facilities it takes the form

$$R=138Q+MD\ \mathit{payments} \tag{3}$$

(we will ignore the *MD payments* term for the present). The facility therefore chooses each element T_i of T such that

$$\frac{\partial C}{\partial T_i}+\left(\frac{\partial Q_D}{\partial T_i}\frac{\partial C}{\partial Q}\right)=138\frac{\partial Q_D}{\partial T_i}. \tag{4}$$

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dimensions of dialysis quality can be captured by some analogous measure (although we do look at some measures of convenience later in the paper). Nevertheless, the result that the average level of 'quality' increases as the number of firms increases has also been derived by Schmalensee.

The critical parameters then are the marginal cost of amenities $(\partial C/\partial T_i)$ and the impact of T_i on demand $(\partial Q_D/\partial T_i)$. If the facility has a monopoly $(\partial Q_D/\partial T_i = 0)$, it will set T as low as is technically feasible. In contrast, if there is competition $[(\partial Q_D/\partial T_i)$ is very large], T will rise to a higher level, one consistent with revenue equals costs (no rents) for a new producer and $Q_D(T) = Q$, i.e., demand equals supply.

Now suppose the reimbursement level is reduced below \$138. The impact on T is obvious.[5] Except for the monopoly case (where T will already have been set as low as is feasible), profit maximizing firms will change T and will probably reduce the level of T (amenities) they choose to provide. At least within some limits, cuts in reimbursement will *cause* reductions in costs, but those reductions are made possible only by reducing amenities.

This positive result has implications for the development of reimbursement policy for this and for other public programs. The law requires reimbursement of providers to be related in some way to cost. The negative incentive effects of setting each firm's reimbursement equal to its actual costs are well known. However, one can only be sure that it is appropriate to estimate a cost function and use it to determine reimbursement levels if all of the independent variables in the cost function are exogenous and/or observable.

The critical empirical problem is that costs depend on amenities (T), but at least some of the elements of T will surely not be observable and so *cannot* be monitored. Theory tells us, in addition, that the level of these elements will vary with reimbursement, i.e., they are endogenous. What is needed is additional information on the behavioral-competitive response of the firm to changes in reimbursement levels. This information cannot be obtained from the cost function; indeed, there is no such thing as 'the cost' to which reimbursement should be related.

However, if we cannot estimate the relevant production function, we can at least obtain some qualitative conclusions about observable firm behavior. Suppose that Z_1 is a facility characteristic which is hypothesized to lower costs and increase efficiency. Then the optimal level of amenities $(\tilde{T})$ will generally be higher for firms with higher values of Z_1. That is, more efficient firms will generally choose higher levels of quality for any output as long as one makes the plausible assumption that increasing Z_1 lowers the marginal costs of treatments $(\partial C/\partial Q)$ or the marginal costs of amenities $(\partial C/\partial T)$ and does not increase either. The estimated coefficient on Z_1 in a production function will therefore be reduced because the higher level of Z_1 causes the omitted components of $\tilde{T}$ to rise and (from the production function) the higher level of $\tilde{T}$ requires Q to fall, inputs held constant. Therefore, if the estimated coefficient for Z_1 is positive, this result would suggest that Z_1 does indeed increase productive efficiency, probably to a greater extent than is indicated by the coefficient. But a zero or negative coefficient for Z_t is consistent with literally any relationship between Z_t and constant-amenity cost or productivity. For example, it may be that increasing Z_t causes the more efficient firm's profit-maximizing level of $\bar{T}$ to increase to such an extent that observed production efficiency and observed unit costs are higher.

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[5] See Held and Pauly (1979, p. 33).

Even in the latter case, however, some insight can be obtained if at least a few aspects of amenity can be measured. Presumably all of the elements of $\bar{T}$ increase with Z_t, though not necessarily by the same amount. Suppose we believe there are costly amenities we cannot observe. If we examine empirically the relationship between an amenity we can observe and Z_t and find it to have a positive effect on the *observed* amenity, this would provide evidence that the estimated production function coefficient is likely to be biased downward because of *unobserved* amenities.

Without an accurate measure of all amenities, we cannot say anything more than this about the production or cost function. However, the estimated function is still useful for predicting how actual output will vary if reimbursement levels are held constant. Moreover, in a later section we suggest a method to test for the existence of amenity bias in the production or cost function itself when the degree of competition varies in a measurable way.

5. Profit functions

If there is amenity competition, then realized profit levels ought to be related to the level of that competition. To see whether this is so, we related a measure of the degree of competition to 'pseudo-profit' earned in a dialysis center or facility. 'Pseudo-profit' adds physician salaries to the excess of revenue (approximated by charges) over costs. That is, it counts as 'profits' both returns to owners and returns to physicians who supervise dialysis. This means that not-for-profit facilities still earn pseudo-profits. The data are from a survey of costs at all Medicare-certified dialysis facilities.[6]

Independent variables include the determinants of aggregate demand and supply, a measure of competition, and a measure of size or fixed capital of the facility (number of dialysis stations). The actual regression estimated is:

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[6] A subsequent audit of a sample of 110 of these units showed that the data were quite accurate by the standards of health services research. The error in reporting was approximately 2 percent. [See *Federal Register* (February 12, 1982, p. 6562) for details.] While revenue would have been preferred to charges, such data were not available. Revenue and charges differ primarily by bad debts. It should be noted that the principal source of bad debts is likely to be the 20 percent coinsurance for outpatient services under Medicare, since the level of the charge is controlled by Medicare; i.e., the dialysis facility cannot charge more than Medicare allows. Apparently, most of the coinsurance is paid by third parties, including Medicaid and private insurance. Ongoing work will examine this issue more carefully, including whether bad debts are an amenity.

$$PSEUDO\text{-}PROFIT = b_0 + b_1(IC) + b_2(PC) + b_3(AREA) + b_4(PRICES), \tag{5}$$

where

$PSEUDO\text{-}PROFIT$ = difference between total charges and total costs,
IC = vector of institutional characteristics,
PC = vector of patient characteristics,
$AREA$ = vector of area variables,
$PRICES$ = vector of input prices.

Table 1 describes the variables and presents the regression results. Competition is measured by the Herfindahl index for the market area (SMSA or county).[7] That index is the sum of the squares of output shares.

As shown in table 1, there is indeed a statistically significant relationship ($t = 1.73$) between competition and pseudo-profit. When competition is high (low Herfindahl index), pseudo-profits are lower, and vice versa. Competition does lead to the erosion of profits. In addition, profits tend to be affected in the expected ways by demand and input variables. Larger dialysis units (measured by the nimber of dialysis stations) earn more pseudo-profit per station, suggesting economies of scale.

While our principal purpose is to focus on the impact of competition on psuedo-profits, some of the other estimated coefficients shown in table 1 have interesting implications which deserve comment. First, the binary terms for type of dialysis institution suggest that, compared to the excluded set of dialysis providers (not-for-profit free-standing facilities), hospital dialysis centers receive greater pseudo-profit per dialysis station, other things equal. (The t statistic of 1.80 is statistically significant at the 7 percent level.) While the negative coefficient for the for-profit chain of providers, National Medical Care, Inc. is only statistically significant at the 14 percent level, it still suggests that compared to the excluded group and hospital dialysis centers, National Medical Care receives less pseudo-profit per dialysis station. This result is certainly counter to the conventional wisdom about which groups of dialysis institutions are receiving the most rents from the ESRD program.

6. Impacts of competition on amenity

The previous section showed that competition in the dialysis market affects profit in the expected way. Since user price is generally irrelevant for

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[7] SMSA is Standard Metropolitan Statistical Area. The Herfindahl index was chosen primarily for empirical convenience. Theoretical reasons for preferring this index when Cournot behavior can be assumed are presented by Dansby and Willig (1979, pp. 249–260).

Table 1

Pseudo-profit for dialysis institutions regressed on institution and area characteristics, U.S., 1978.[a]

Independent variables	Mean	Standard deviation	Regression coefficient	*t* statistic
A. *Institution characteristics*				
1. Type of dialysis unit (binary)				
a. Hospital dialysis center	0.36	0.48	57.484	1.80
b. Hospital dialysis facility	0.14	0.34	30.818	0.78
c. Hospital transplant center	0.16	0.36	−33.430	−0.90
2. Profit status (binary)				
a. National Medical Care, Inc.	0.10	0.31	−62.605	−1.49
b. Other for-profit	0.17	0.37	−986	−0.03
3. Physician capitation (binary)	0.47	0.50	25.314	1.32
4 Number of dialysis stations	13.37	8.22	9.155	6.91
B. *Patient characteristics*[b]				
1. Proportion of patients:				
a. Dialyzing at home	0.19	1.07	−549	−0.04
b. Partial care	0.04	0.16	104.617	1.77
c. Self-care	0.01	0.08	44.584	0.38
d. In training for home care	0.02	0.06	−75.420	−0.44
e. Non-Medicare	0.14	0.26	−41.071	−0.81
C. *Area variables*				
1 Herfindahl index	0.49	0.38	76.587	1.73
2. Population per sq. mile	1.921	5.359	−0.78	−0.38
3. Total population	2.12E+6	2.73E+6	0.02	4.38
4 Percent black	13.20	11.40	1.104	1.09
5. Urban binary	83.43	21.11	364	0.58
6 Median family income (1969)	8.789	1.785	−13.36	−1.33
D. *Input prices*				
1. House rent[c]	10.98	2.43	2561	0.35
2. Nurse salary per year ($)[d]	19.076	17.639	1.04	1.94
Constant			−38.958	−0.40
Adjusted R^2 *n*			0.16 651	
Joint *F* statistic			5.97	
Dependent variable (pseudo-profit)	$155.478	$252.617		

[a] Pseudo-profit is the difference between charges and all costs except physician salary (See table A-1 for details on data sources.) *n* is sample size.
[b] As a proportion of patients dialyzing in the facility.
[c] Median rent per month 1970 times 0.1.
[d] This is the annual salary for nurses in the year of the survey in the individual dialysis unit.

Medicare patients,[8] the method by which competition reduces profits must involve a positive relationship between competition and the level of amenity. The direct measurement of the impact of competition and profit status on some observable indicators of amenity would provide a further test of whether the Douglas–Miller and Joskow model of competition applies.

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[8] While patients theoretically pay 20 percent coinsurance, in reality few or no patients face out-of-pocket payments.

One measure of amenity which might be expected to matter to patients in their choice of dialysis facility is the ability of the facility to accommodate them at a time they prefer. Since many patients are likely to prefer to dialyze about the same time of day, the peak load capacity of the facility could serve as a proxy measure of this amenity. If we assume that the distribution of demand is similar across facilities, so that peak demand is proportional to total demand, the number of dialysis machines per patient[9] would indicate the maximum capacity of a facility of a given size. Of course, the law of large numbers suggests that the probability that no machine is available is also inversely related to facility size. Rather than assume a particular distribution of arrivals and calculate an estimated probability [as Joskow (1980) has done for hospitals], we simply include facility size in the regression.[10]

Regressions for free-standing facilities relating peak load capacity to size of the institution, competition, and possible efficiency variables are shown in table 2 for large city markets. As indicated in the first column, facility size and city size are both inversely related to the number of machines used to handle peak loads (dialysis machines per patient). However, despite the negative correlation of the Herfindahl index with city size, there is a statistically significant effect in the expected direction: competition does cause facilities to hold more backup capacity. The regression also indicates that for those for-profit facilities associated with National Medical Care, Inc., amenities are higher.

The other two regressions (2 and 3) show the effect of adding measures of hours of operation and of the nursing wage rate. Longer hours of operation would permit a facility to use fewer machines, although hours themselves could reflect amenity levels. There is indeed a statistically significant inverse relationship between hours and the number of stations, although most of the other coefficients and statistical significance levels are unaffected. The coefficient on the wage rate has the appropriate sign but is not estimated very precisely.

On balance, these results are highly consistent with the view that amenity levels are affected by competition. They are also consistent with the view that amenity levels are positively related to differences across firms in ownership-related incentives for productive efficiency.

7. Production function estimates and tests for amenity bias

The results of the two preceding sections suggest that there can be amenity bias in estimates of production and cost functions. As indicated in the

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[9] We use the number of patients who dialyze at the facility, i.e., we exclude patients who dialyze at home.

[10] Joskow (1980). To derive the underlying stochastic process, one would need to know the distribution of preferred arrival times.

Table 2
Estimates of amenity level (machines per facility patient) for non-hospital dialysis facilities, 1977–78.[a]

Independent variables	Dependent variable: dialysis machines per facility patient Coefficients and (*t* statistics) (1)	(2)	(3)
A. *Facility characteristics*			
1. Size (log of dialysis treatments per year)	−0.089	−0.058	−0.055
	(7.81)	(4.36)	(4.05)
2. Profit status (binary)			
a. National Medical Care, Inc.	0.074	0.058	0.060
	(2.47)	(2.10)	(2.14)
b. Other for-profit	0.013	−0.010	−0.008
	(0.46)	(0.38)	(0.31)
3. Physician capitation (binary)	−0.001	0.001	0.004
	(0.07)	(0.03)	(0.20)
4. Hours per week the facility is open	—	−0.002	−0.002
	—	(3.70)	(3.68)
B. *Patient characteristics*			
1. Proportion partial care	0.083	0.064	0.060
	(1.49)	(1.23)	(1.16)
2. Proportion non-medicare	0.301	0.298	0.292
	(2.73)	(2.92)	(2.86)
3. Proportion home care	0.189	0.141	0.129
	(1.75)	(1.41)	(1.28)
C. *Area variables*			
1. Herfindahl index of market concentration	−0.330	−0.289	−0.295
	(1.59)	(1.50)	(1.54)
2. Log of 1975 population in the SMSA or county	−0.059	−0.044	−0.048
	(1.95)	(1.43)	(1.56)
3. Nurse salary rate per year ($1,000's)	—	—	−0.001
			(1.14)
D. *Constant*	1.51	1.30	1.32
Adjusted R^2/n	0.46/83	0.54/83	0.54/83
Joint *F* statistic	8.86	10.72	9.91
Mean of dependent variable	0.288	0.288	0.288

[a] Sample is restricted to dialysis units in SMSAs with population in excess of 1.5 million. Data are from the 1977 Facility and 1978 Cost Surveys. Patient characteristics are expressed as a proportion of facility patients. Logs are natural logarithms. Population is in 1,000s. *n* is the sample size.

theoretical discussion, this effect would tend to bias estimates of the impact of characteristics associated with greater efficiency where competition is more vigorous. In this section we present and discuss results of production functions estimated for 'high' and 'low' competition subsamples. Coefficients in the low competition subsamples should come closer to the 'true' production function coefficients for a constant quality output. In this sense, a finding that the degree of competition affects the relationship between observed output and its determinants is a test for amenity bias. While the results are, we believe, of considerable value in themselves, they also illustrate the importance of taking competitive effects into account. We first discuss some aspects of the estimation of production functions.

A. Functional forms

A Cobb–Douglas production function is the usual starting point for discussion. However, for the case at hand, this functional form is somewhat restrictive in the constraints it imposes, a priori, on one's empirical estimates. First, the mathematical form of the function forces the estimated scale-elasticity of output to be constant at all input combinations regardless of the scale-elasticity that may prevail in reality. Second, the function requires *all* inputs to be used at a positive rate for positive rate of output. In the case of dialysis facilities, positive output may be produced even in the absence of some inputs (i.e., non-medical support staff or physicians).

In principle, one would prefer a functional form that is less restrictive, a priori. One specification meeting that requirement is the so-called transcendental function[11] and a variation of it which has been successfully used in other applications:[12]

$$Q = AK^{a_1}S^{a_2}\,e^{(a_3M)+(a_4L_1)+(a_5L_2)+a_6(L_1+L_2)^2}\,e^{\Sigma(b_iz_i)}, \qquad (6)$$

where Q is output, K is capital equipment, S is supplies, M is the number of physicians, L_1 is non-physician *medical* labor, L_2 is *non-medical* labor, and Z_i are characteristics of the facility or its output. Eq. (6) differs from a Cobb–Douglas function primarily in that:

(a) Positive outputs are possible with zero levels of personnel inputs, although capital and supplies must have positive values for positive outputs.

(b) The function permits the scale elasticity of output to vary over the set of input combinations and permits both increasing and decreasing marginal returns to any particular input.

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[11] See Held and Reinhardt (1979).

[12] In addition to Held and Reinhardt (1979), see also Pauly (1979).

The equation estimated is

$$\ln Q = \ln A + a_1 \ln K + a_2 \ln S + a_3 M + a_4 L_1 + a_5 L_2$$
$$+ a_6 (L_1 + L_2)^2 + \sum_i b_i Z_i . \qquad (7)$$

B. Measures of output

A dialysis facility produces several outputs. The measure of output used is the number of in-facility dialysis treatments provided during calendar year 1978 for free-standing and hospital-affiliated dialysis facilities.[13]

An additional output that a facility provides and which affects our analysis is the support services to patients who receive their dialysis at home. Since the inputs to provide these support services to home patients are the same inputs that provide the in-center dialysis, we need to adjust our single output measure (in-center dialysis treatments) for the number of home patients. We accomplish this by entering the proportion of home patients as a controlling facility characteristic (a Z_i term) in the production function.

C. Inputs

Inputs to the dialysis process include labor of various types, capital (as approximated by the number of dialysis stations) and supplies. We use the physical number of units of labor and capital but measure supplies by the dollar costs of supplies and medications.[14] The number of physicians is also included as an input. (It is possible to dialyze patients when no physician is present.) Other labor is measured by the number of full-time equivalent registered nurses, dialysis technicians, and other nursing (medical labor), and by dieticians, social workers, and other personnel, presumably clerical and administrative (non-medical labor).

D. Facility characteristics

Facility characteristics which affect the production function include profit status (profit and not-for-profit), whether hospital-based or not, the method of physician compensation (fee-for-service and capitation), and the fraction of patients provided partial care. All of these variables could be thought to have effects on the efficiency of the production process.

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[13] See appendix table A-1 for more details.

[14] The survey which provided all other physical input data for 1977 did not provide measures of supply costs input for 1977 and supplies are an important input to the dialysis process. However, a survey of costs for either the same year or 1978–79 did provide a measure of supply cost for the same units. We therefore assumed that the supplies–output function in 1977 for any facility was the same as that in the year of the cost survey. See appendix table A for more details.

E. Unit of analysis

The unit of analysis is the individual dialysis facility. It is at the level of the individual unit that dialysis services are sold and produced. One could imagine other units of analysis, for example, the firm level. Returns to scale can be addressed at the plant (dialysis unit), firm, or industry level.[15] In terms of dialysis treatments, the present focus on the dialysis unit asks the question of returns to scale in terms of an individual 'plant'. If one were to focus on the level of the firm, then the question is whether returns to scale exist for firms which may have multiple dialysis facilities (plants). Returns to scale at the firm level might exist even if there were no technical returns to scale in producing dialysis services per se. For example, there could be efficiency gains of sharing the costs of transactions with the federal government which might be present at the level for the firm but have no effect on the technical production of dialysis treatments per se.

While there are numerous firms which own more than one dialysis facility, the data used for this project only permitted identification of the largest firm: the for-profit firm National Medical Care, Inc. In our analysis we therefore use National Medical Care, Inc. ownership as a controlling facility characteristic. Such an approach will not be a test of returns to scale at the firm level but will indicate productivity characteristics for a particular for-profit firm with numerous facilities. The degree of technical returns to scale at the level of the dialysis facility will be estimated using the entire sample of dialysis facilities.

F. Data

Definitions for variables used in the production functions are provided in appendix table A-1. Basic statistics for these variables are contained in appendix table A-2. Almost all of the data derive from the 1977 Facility Survey (FS), a periodic survey of dialysis facilities conducted by the Health Care Financing Administration (HCFA).

G. Results

Table 3 presents the results of production function estimates for three samples. The first two columns show results from subsamples selected on the basis of the level of the Herfindahl index of concentration. The last column shows the results that would be obtained if the data from the full sample of facilities were pooled; it corresponds to the usual presentation of results when amenity bias is not taken into account.

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[15] See Nerlove (1968, pp. 409–438).

An *F* test rejects the null hypothesis that the two subsamples are drawn from the same population.[16] In addition, the degree of competition does affect the observed relationship between inputs or firm characteristics and production. Moreover, the differences in individual coefficients are in striking agreement with the amenity bias view. For example, the two variables that represent for-profit status, either as a member of National Medical Care, Inc. or as another kind of for-profit firm, are both significantly larger (and positive) in the low competition (high Herfindahl) subsample than in the other subsample. In fact, the National Medical Care Inc. variable is not even statistically different from zero in the competitive subsample. These results are consistent with the view that the for-profit form of organization leads to greater production efficiency, but that in competitive markets these efficiency gains are transferred to consumers in the form of higher levels of amenity.[17] The fraction of partial care patients also has a significantly smaller effect in competitive markets than in less competitive ones, suggesting that the resources saved when patients are easier to treat tend to be converted into amenities when competition is strong. In contrast, when competition is weaker, resource savings (and presumably cost savings) accrue to the producer. Finally the variable measuring the use of the capitation for physician compensation also shows a significantly smaller effect in the competitive subsample than in the other subsample. Either because of greater incentives for efficiency, or because of greater selectivity of patients, capitated medical staffs have twice as large productivity improvement (over fee-for-service staffs) in non-competitive markets as in competitive ones.[18]

There is also some evidence of amenity bias in the estimates of returns to scale. Theory does not give an *a priori* prediction about the direction of bias. Nevertheless, we can say that a monopolist should have no incentive to raise quality above the minimum level required by technology or regulation at any output, so that the estimate of returns to scale for such firms should

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[16] The *F* test was for a basic production function between free-standing and hospital-based dialysis facilities for Herfindahl indices less than 0.5 and greater or equal to 0.5. The *F* statistics of 2.24 suggests rejection of the null hypothesis of the two subsamples being drawn from the same population at an alpha level less than 0.01. Since there are relatively few observations at a Herfindahl value of 0.5, the results would probably not be very sensitive to choice of the cutoff point.

[17] Because of the essential ambiguity about the goals of not-for-profit firms, other interpretations of these results are, of course, possible. For example, it could be that not-for-profit firms provide about the same level of quality everywhere, whereas for-profit firms skimp on amenities when competition is sufficiently lax. However, the results in the previous section that National Medical Care, Inc. provides more amenity would not be consistent with this alternative interpretation. Our ongoing work will be able to shed more light on this alternative interpretation.

[18] Patient selection should probably be more difficult in less competitive markets because there would be fewer other firms on which to dump unusually difficult-to-treat patients. Because this difficulty should tend to reduce the coefficient in such markets, the larger coefficient actually found there is even more surprising.

Table 3

Production function estimates for free-standing and hospital-based dialysis facilities by dialysis market concentration, U.S., 1977–1978[a]

Independent variables	Market concentration[b] $H < 0.5$		$H > 0.5$		All H	
A. *Inputs*						
1. Dialysis stations (log)						
b (*t* statistics)	0.324	(4.000)	0.395	(5.815)	0.377	(7.122)
marg. prod. (elast.)	136	(0.324)	147	(0.395)	159	(0.377)
2. Supply costs (log)						
b (*t* statistic)	0.603	(11.461)	0.562	(13.210)	0.601	(17.759)
marg. prod. (elast.)	0.014	(0.603)	(0.013)	(0.562)	0.014	(0.601)
3. Physicians						
b (*t* statistic)	0.002	(0.171)	0.005	(−0.220)	0.005	(0.456)
marg. prod. (elast.)	13	(0.005)	−27	(−0.01)	28	(0.010)
4. Non-physician medical personnel						
b (*t* statistic)	0.015	(2.20)	0.032	(3.856)	0.019	(3.713)
marg. prod. (elast.)	64	(0.171)	131	(0.342)	78	(0.200)
5. Non-physician other personnel						
b (*t* statistic)	0.013	(1.440)	−0.003	(−0.227)	0.012	(1.557)
marg. prod. (elast.)	56	(0.028)	−53	(−0.028)	37	(0.020)
6. Total non-physician personnel squared						
b (*t* statistic)	0.88E−4	(−1.38)	0.24E−3	(−1.872)	1.4E−4	(−2.717)
Returns to scale[c]:						
Evaluated at mean of own sub-sample	1.151		1.218		1.207	
Evaluated at mean of total sample[d]	1.130		1.261		1.207	

B. *Facility characteristics*						
1. Profit status (binary)						
a) National Medical Care, Inc.						
b (*t* statistic)	0.104	(1.244)	0.144	(1.894)	0.021	(0.366)
b) Other profit						
b (*t* statistic)	0.007	(0.093)	0.149	(2.018)	0.099	(1.915)
2. Physician capitation (binary)						
b (*t* statistic)	0.087	(1.769)	0.176	(3.549)	0.130	(3.676)
3. Hospital-based dialysis facilities (binary)	0.081	(0.944)	0.020	(0.244)	0.070	(1.165)
C. *Patient characteristics*[e]						
1. Partial care						
b (*t* statistic)	0.156	(1.302)	0.298	(2.058)	0.204	(2.197)
2. Non-medicare						
b (*t* statistic)	0.161	(0.618)	0.534	(2.213)	-0.352	(1.977)
3. Home patients						
b (*t* statistic)	0.015	(0.246)	0.046	(0.221)	0.051	(0.993)
D. *Constant*						
b (*t* statistic)	0.077	(0.139)	0.061	(0.138)	0.186	(0.524)
Adjusted R^2/sample size	0.90/148		0.94/129		0.92/277	
Joint *F* statistic	91.18		126.17		227.61	
Mean of dependent variable						
Log	8.524		7.855		8.212	
Absolute	6929		3853		5497	

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[a] See table A-1 for definitions and sources. Log is the natural logarithm. Personnel are measured in full-time-equivalents. Marg prod is the marginal product. Elast. is the elasticity. Both elasticity and marginal product are evaluated at the mean of the total sample. Definition of hospital-based dialysis facilities is as defined by the Health Care Financing Administration; does not include dialysis centers or transplant centers in hospitals.

[b] Herfindahl index of concentration in the SMSA or county.

[c] Sum of the input elasticities.

[d] The approximate standard errors of these estimates are 0.086, 0.079 and 0.048 respectively.

[e] As a proportion of facility patients.

approximate the true constant quality value. A subset of less competitive firms should contain more such firms. In contrast, the estimate of returns to scale for the more competitive subsample would be subject to greater bias. The last two lines of section A in table 3 show two alternative measures of returns to scale, derived from the coefficients on the inputs. One measure evaluates return to scale at the full sample mean input levels and proportions, whereas the other measure is evaluated at the means for each subsample. In both cases, estimated returns to scale are higher in the less competitive subsample than in the more competitive one.[19]

The last column shows that if amenity bias were not taken into account, one would tend to draw incorrect inferences from regression results. If one looked only at the combined sample, one would incorrectly conclude that National Medical Care, Inc. firms were less efficient than other for-profit firms and no more efficient than not-for-profit firms. One would also derive estimates of the effects of other efficiency shifters or of returns to scale which were too small.[20]

In addition to finding that virtually all individual coefficients exhibit significant differences consistent with the amenity bias view, the fact that all of the differences go in the direction suggested further supports the theory. The likelihood that these consistent differences would occur together by chance is quite low.

8. Conclusion

The theory discussed in this paper suggests that estimated coefficients for medical service production or cost functions are subjected to a 'competitive amenity bias' which may result in the failure to identify factors that affect economic efficiency. That is, observations on actual cost or productivity will generally not yield unbiased estimates of cost or production function parameters so that estimates of the cost of care based on those parameters will be biased by the degree of amenity competition. The most we can do is determine whether bias is present, and if it is, to estimate qualitative effects. Our investigation of productivity of dialysis facilities did indeed indicate both the likelihood of bias and some qualitative results.

If there is competitive amenity bias, what does this imply for attempts to set reimbursement levels? It implies first of all that it will be very difficult to estimate cost, even for a typical producer. It also implies that variation in the level of reimbursement will, in competitive markets, affect the level of amenity delivered to patients. *Incurred cost, amenity, and patient well-being*

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[19] The difference in the returns to scale estimates between competitive and non-competitive markets is statistically significant at the 0.13 level (type I error) using a one-tailed test. See the approximate standard errors in footnote d of table 3.

[20] For a more detailed discussion of production function results, see Held and Pauly (1980).

will all vary positively with the reimbursement level. Determining the 'right' level of reimbursement is not a (theoretically) simple matter of determining cost-plus-normal profit and setting reimbursement equal to that. Rather, ideal reimbursement requires a *policy decision on how much total amenity society wishes to deliver to beneficiaries of public programs.* While some amenities have been excluded as not reimbursable, there has yet to be a decision on the complete set of amenities.

Finally, once the level of amenity is determined, there are two possible policies. If amenity can be monitored and regulated by the public payer (which is often difficult if not impossible), then reimbursement can be varied with factors that affect cost. If, as seems likely, amenity cannot be controlled or monitored, then amenity will vary across beneficiaries and providers, depending on input costs, organizational structure, and the degree of competition. Considerably more information about amenity levels, cost, and how they vary with competition is needed in order to determine proper reimbursement levels.

While we were able to evaluate the potential impacts of various devices on reimbursement behavior, we are unable to move from such positive analysis to a normative prescription of an 'ideal' reimbursement rate. This is because literally any fixed rate is conducive to cost minimization (at least for the predominant for-profit-firms), but the level of the rate determines the level of amenity and accessibility (depending on the degree of competition and profit). Without an explicit statement about (or even definition of) the ideal level of these characteristics, it is not possible to fix a reimbursement rate. Analysis is, nevertheless, useful for pointing out that there are likely to be conflicts between regulators interested in reducing program costs and renal disease patients interested in making their lives as bearable as possible.

Appendix

Table A-1
Source of variables used in the production function estimates for non-hospital free-standing and hospital-based dialysis facilities.[a]

Variable definition	Source remarks
A *Output*	
1. Total number of dialysis treatments provided in one-year period to Medicare patients	FS
B *Inputs*	
1. Total number of dialysis stations	FS
2. Number of physicians	FS
3. Non-physician medical personnel	FS
4. Non-physician non-medical personnel	FS
5. Supply and medication costs per year	CS
C. *Facility characteristics*	
1. Profit status (binary)	
a. All for-profit facilities not owned by NMC	RPL
b. For-profit facilities owned by NMC	NMC
2. Physician capitation (facility compensates physicians on capitation basis)	HCFA
3. Hospital-based dialysis facility	RPL
D *Patient characteristics*	
1. Patients receiving partial care dialysis	FS
2. Non-Medicare patients	FS
3. Patients dialyzed at home	FS
4. Patients undergoing training for home dialysis	FS
E. *Area variables*	
1. Herfindahl index, a measure of dialysis market concentration based on the sum of the squared market shares in the SMSA or county	FS
2. Population in the SMSA or county (1975)	CCDB
3. Median monthly rent (of resident population) in the SMSA or county (1970)	CCDB
4. Annual salary of nurses in the facility	CS

[a] FS is the U.S. Department of Health and Human Services', Health Care Financing Administration's (HCFA) 1977 'Facility Survey'; CS is HCFA's 'Cost and Statistical' Survey. The majority of the surveys were for 1978, although there were some surveys for 1977 and 1979. Supply costs were adjusted to 1977 level of treatments reported on the FS by a regression technique which allowed for time effects, individual effects for each facility and the level of treatments. A few surveys were for a reporting period greater or less than 12 months. In such cases, all data were adjusted to a 12-month basis. RPL is the Renal Provider List, a HCFA publication (NO. 10004, June 1979 and January 1980). NMC is National Medical Care, Inc. of Boston, Mass. A listing of facilities owned by NMC was provided via a memorandum dated 1979. CCDB is the U.S. Department of Commerce's City and County Data Book (U.S. Government Printing Office, Washington, DC, 1975). SMSA is Standard Metropolitan Statistical Area. Personnel are in full-time equivalents. Patient characteristics are as a proportion of facility patients. Definition of hospital-based dialysis facilities is as defined by HCFA, does not include hospital dialysis centers or hospital transplant centers.

Table A-2

Means and standard deviations for free-standing and hospital-based dialysis facilities by dialysis market concentration, U.S., 1977–1978[a]

Independent variables	Market concentration[b] *H* < 0.5		*H* ≥ 0.5		All *H*	
A. *Inputs*						
1. Dialysis stations						
Log	2.55	(0.61)	2.16	(0.65)	2.37	(0.66)
Absolute	15.25	(9.39)	10.54	(6.51)	13.05	(8.50)
2. Supply costs						
Log	12.25	(0.88)	11.70	(0.96)	11.99	(0.95)
Absolute ($1000s)	292.75	(244.75)	174.69	(141.91)	237.77	(211.48)
3. Physicians	2.45	(1.91)	1.49	(1.23)	2.00	(1.69)
4. Non-physician medical personnel	17.06	(12.82)	11.06	(9.01)	14.27	(11.58)
5. Non-physician other personnel	3.20	(4.54)	2.43	(2.74)	2.85	(3.82)
6. Total non-physician personnel squared	638.70	(1211.62)	287.99	(627.33)	475.37	(997.55)
B. *Facility characteristics*						
1. Profit status (binary)						
(a) National Medical Care, Inc.	0.25	(0.44)	0.27	(0.45)	0.26	(0.44)
(b) Other for-profit	0.45	(0.50)	0.26	(0.44)	0.37	(0.48)
2. Physician capitation (binary)	0.45	(0.50)	0.41	(0.49)	0.43	(0.50)
3. Hospital-based dialysis facilities (binary)	0.14	(0.35)	0.29	(0.45)	0.21	(0.41)
C. *Patient characteristics*[c]						
1. Partial care	0.07	(0.22)	0.04	(0.17)	0.05	(0.20)
2. Non-medicare	0.12	(0.12)	0.12	(0.11)	0.12	(0.12)
3. Dialyzing at home	0.08	(0.50)	0.06	(0.19)	0.07	(0.39)
D. *Area variables*						
1. Herfindahl index	0.17	(0.13)	0.86	(0.19)	0.49	(0.38)
2. Population (1975) in SMSA or county						
Log	14.68	(1.02)	11.92	(1.06)	13.39	(1.72)
Dependent variable						
Dialysis treatments						
Log	8.52	(0.85)	7.86	(0.98)	8.21	(0.97)
Absolute	6929	(5818)	3853	(3286)	5497	(5040)

[a] See table A-1 for definition and sources. (Standard deviations are in parentheses.) Log is the natural logarithm. Definition of hospital-based dialysis facilities is as defined by the Health Care Financing Administration; does not include dialysis centers or transplant centers in hospitals.

[b] Herfindahl index of dialysis market concentration in the SMSA or county if non-metropolitan.

[c] As a proportion of facility patients.

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SAVINGS FROM HOME DIALYSIS: FAR LESS THAN EXPECTED

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ABSTRACT

Home dialysis has long been encouraged as a form of therapy under the general belief that it is less expensive to insurers. This study shows that the savings are likely to be much smaller than the common wisdom and there may even be no savings at all. This study confirms prior findings of a reasonably large direct saving for each home patient compared to in-facility patients. However, this study also shows that as patients are sent to home dialysis costs rise for other patients who remain in the dialysis unit. This indirect, and previously ignored, effect nearly offsets the large direct effect. This previously unreported effect on costs is most likely caused by less costly patients being assigned home dialysis and the transfer of some costs of home dialysis to in-center patients. These results help to explain why there has been very small growth in the proportion of patients on home dialysis even though recent policy changes would have made home dialysis very profitable if the costs were indeed as low as previously believed. Finally, these results suggest that the choice of a dialysis location should remain a medical decision to be made by patients, physicians and their families.

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INTRODUCTION

Home dialysis for Medicare's kidney-failure patients has long been promoted as a more independent and successful mode of treatment than in-facility care.[1] Federal policymakers have more than once acted to encourage home care by altering Medicare rules, which initially disfavored such treatment.[2,3,4,5] Such changes often have been promoted on medical grounds, but perhaps even more important has been the conventional wisdom that Medicare saves money when a patient goes home. Early estimates promised large savings. For example, as shown in Table 1, Blagg,[6] based primarily on the work of Hoffstein,[7] forecast annual savings of $9,791 for dialysis costs only, or 59 percent of per-patient cost, for each switch to home care from limited-care dialysis in a unit. His estimate of the home-care dividend as compared to hospital-based outpatient dialysis was even larger, at 73 percent of average cost.

More recent work has, however, eroded the basis for expecting such high savings for Medicare (and coinsurers as well), even as the premise of large savings was used to justify a lower federal payment rate for dialysis.[4,5] Eggers[8] calculated the average difference in total annual Medicare payments per person (for all covered medical services, not just dialysis) for those dialyzed at home and those dialyzed in an outpatient facility. His estimate (Table 1) indicated an average savings of 21 percent but explicitly did not take into account possible differences between the two sites in patient severity or other factors. It therefore constitutes more of a calculation of observed differences in spending between home patients and in-unit ones than an analysis of the impact of a patient's going home rather than into a unit for dialysis.

Table 1. Selected Estimates of the "Savings" of Home Dialysis.

Source	Time Period	Costs Included	Methodology	Adjusted for Unit and Patient Covariates?	Estimated "Savings"	Remarks
Hoffstein[7] and Blagg[6]	1973	Dialysis only	Cost allocation based on "use or effort" of 5 programs and 550 patients	No	59% to 73%	Lower estimate compares home to limited care dialysis; higher, to hospital units
HCFA[4]	1977-1979	Dialysis only	Accounting audits and record review of 128 programs	No	11% to 39%	Lower estimate compares home to independent units; higher to hospital units
Eggers[8]	1974-1977	All Medicare costs, including dialysis	Simple patient means based on Medicare claims from a near census of patients	No	21%	Source of data is the same as used by Held and Pauly
Held and Pauly[9]	1977 and 1980	All Medicare costs, including dialysis	Simple means based on Medicare claims from a sample of 7,157 patients	No	25%	Consistent with Eggers for 1977 but decreased to 12% in 1980
Held and Pauly[9]	1977-1981	All Medicare costs, including dialysis	Differences in per-patient costs in units with different numbers of home patients (across 1,391 provider years)	Yes	1.4%	Patient and provider covariates held constant

Held and Pauly[9] used the same type of Medicare payment data as did Eggers to analyze the impact of home care on total costs. But they took a somewhat different approach. First, they used multiple regression techniques to control for other factors. Second, instead of comparing all home patients with all non-home ones, they compared facilities with different fractions of patients at home versus in the unit with one another. They found that there was no statistically significant difference in Medicare cost per patient in units where more patients went home—holding the size of the dialysis unit constant, along with a number of other factors. However, when they calculated only the simple, unadjusted difference in average payments by site using individual patient data for 1977, they obtained estimates much like those of Eggers for 1974-77. Thus, Held and Pauly's work confirms Eggers' findings about average costs attributed to home patients but contradicts the implication that Medicare saves money when a patient goes home.

This paper reconciles these different estimates and concludes that the overall savings from home dialysis are small at best, both for dialysis units and for society. This analysis accounts for more subtle effects than previous work. Such effects include case mix shifts and indirect cost changes, in addition to any direct cost differences shown by conventional accounting and simple averages.

The basis of our approach is to take account of all cost shifts that may accompany moving patients to home. Consider first the costs for dialysis only. Obviously, one possible change is that the costs of dialysis for the home patient are lower than they would have been for the same patient in a unit (because of reduced spending on paid labor, for instance). Less obviously, in-unit costs per patient may change as the proportion of at-home patients rises. For example, many costs of administration and back-up for an outside patient are likely to remain in the unit even when that patient leaves the unit to dialyze at home. Such potential costs have generally been ignored as a component of home care because the payments that cover them are not normally specifically earmarked for home patients. Another way that costs for in-unit care may rise is that home patients may be less severely ill;[10] if so, when they leave a unit, costs per patient will almost certainly rise for the remaining higher-risk group.

Such possible cost shifts for dialysis only are of considerable concern to the units involved as well as to Medicare and other payers (including patients). But dialysis services and supplies account only for roughly half of total Medicare costs;[11] the balance involves inpatient care, physicians' services (both renal and non-renal), and other items. So possible changes for other categories are also important. Similarly here, costs could rise or fall when patients move home: If healthier patients move home, their physician, hospital, and other costs will show lower totals than higher-risk in-unit patients. The same would be true if home care improved health status relative to in-unit care. Conversely, if home care raised the risk of infections requiring hospitalization, for instance, non-dialysis home costs could possibly rise.

Taking all such factors into account, we find that switching a patient from facility to home dialysis appears to cause additional indirect costs to Medicare and to patients that offset most of the direct "savings" shown by conventional accounting and simple averages. Overall, our analysis implies that, at most, savings from home dialysis are in the range of 0 to 4 percent of total cost.

METHODS

Methods of Analysis

Costs per ESRD patient per year (as defined by Medicare) are analyzed in a multiple linear regression to sort out the influence of home care on costs while controlling for 16 patient characteristics, 17 provider characteristics, local price levels, and year of the observation. This paper focuses primarily on two measures of policy interest and their influence on costs, if any: whether or not the individual patient received dialysis in the home and what proportion of the dialysis unit's patients were receiving dialysis in their homes.

The many covariates included serve as controls to eliminate confounding influences. The regression contains a total of 39 covariates, with individual patients as the unit of analysis. Patient covariates include age, race, initial and complicating conditions leading to renal failure (including the presence of diabetes), and length of time since first dialysis. Dialysis provider covariates include the type of unit (e.g., freestanding, hospital-based), size (patient months per year), ownership (e.g., profit, nonprofit, government), and physician financial incentives (extent of the link between physician effort in the dialysis unit and physician income from the unit).

The model specified was homogeneous of degree 1 in prices, as is desirable in estimating cost equations.[12] The dependent variables were expressed as the natural log of the measures of cost, deflated by one of the price variables. The covariates included the log of the ratio of the two price variables.

The two covariates of primary interest (a measure of individual home patients and the proportion of home patients in the entire dialysis unit) were estimated as endogenous variables to correct for possible simultaneous equations bias due to self selection.[13] The method of estimation for two-stage least squares was instrumental variables using the SAS subroutine.[14] The identifying variables included a set of state binaries, per capita income in the area of the provider, and other measures derived from both the federal census[15-17] and a special survey of dialysis providers.[9]

Because costs tend to be distributed in a fashion that is more log normal than normal, the model estimated used the natural log of the four dependent variables (outpatient costs, inpatient costs, physician costs, and all other costs). The covariate specification included continuous variables in natural logarithms as well as binary variables (either 0 or 1).

Translation of the estimated regression coefficient into quantified effect was performed using differential calculus for the continuous measure of the ratio of home patients to facility patients. Since the indirect cost effects apply to all patients associated with a particular dialysis unit, the total indirect effect is the product of the differential effect per patient times the total number of patients in the dialysis unit. The average-sized dialysis unit with home patients was used in this indirect cost calculation (Appendix A).

Translation of the impact on savings of the coefficient for noncontinuous binary measure for the individual home patient was done according to the method developed by Halvorsen and Palmquist.[18] The estimated total Medicare cost per ESRD patient year was derived from Held and Pauly.[9] The mean estimates used here are higher than some other published estimates (e.g., Eggers)[8] since the data used here include transplant patients as well as dialysis patients and include patient obligations that are part of defined

Medicare costs. Since the emphasis is on differences in spending according to dialysis units, using a different set of means would not materially change the results.

Alternative specifications of the measure of home patients as a proportion of facility patients were tried in the estimation to determine if there were significant nonlinearities in the effect of this variable. For example, a quadratic specification was tried under the theory that past a certain size of home program, associated costs per patient would decline. This specification did not produce statistically significant results, and only the linear measure of the proportion of home patients is presented here.

Data

Basic data used in this paper come from three sources. Medicare costs come from the Medicare claims data maintained by the U.S. Department of Health and Human Services, Health Care Financing Administration (HCFA), Baltimore, Maryland.[19] As used throughout this paper, "cost" means total allowed or approved Medicare costs, including patient obligations (e.g., 20 percent coinsurance for Part B services). Patient status (home patient or not) also came from this source. Cost data are thought to be very complete, but there is some underreporting on the site of dialysis. During the study period, ESRD care was paid for largely on a reasonable cost basis, so Medicare-defined costs are not an unreasonable cost benchmark to use. Earlier cost estimates also used such data. (Nephrologists were generally paid HCFA-set fees or monthly capitation amounts, and dialysis units independent of hospitals were paid cost or charges up to a fee "screen" or maximum.)

Data for the proportion of a dialysis unit's patients receiving home dialysis come from HCFA's Facility Survey, a periodic survey of all Medicare dialysis providers.[20] The response rate to this survey is in excess of 98 percent; it gives the most reliable count of home patients by dialysis unit. The Urban Institute's 1982 Survey of Dialysis Institutions[9] was used for covariate measures of physician financial incentives, units' policy on reuse of dialyzers, and other unit policies regarding patient amenities. Finally, data on per capita income and local price levels in the area of the dialysis unit came from the U.S. Census.[15-17]

The analyses were based on a stratified random sample of 2,067 patient years of individual Medicare cost data from 1977 through 1981. To increase precision of the estimates, the sample was stratified so as to overselect home patients for analysis: 32 percent of the sample were home patients, compared with about 17 percent for the population as a whole.

RESULTS

We present first the direct effects of home care by individual. Table 2 shows how an individual patient's receiving home dialysis therapy affects four categories of Medicare-defined costs, other covariates held equal. For reasons that will become clearer below, we refer to these results as the direct effect or "savings" of home dialysis. Column two shows mean costs per patient year by category—outpatient (largely dialysis), inpatient, etc. Column three shows dollar "savings" per patient, based on the mean per-patient estimates. Statistical significance is shown by the associated p-values given in parentheses.

Overall, some $6,060 per year (or 17.1 percent of total cost) is the estimated direct savings of having a patient dialyze at home as compared to in a facility. (Obviously, a major analytical issue is to what extent these

Table 2. Direct "Savings" of Home Dialysis in Medicare-Defined Costs, 1977-1981.[a]

Category	Mean Annual Cost, All ESRD Patients[b]	Direct Cost Decrease Per Home-Patient Year, Other Covariates Equal[c] (p-Value)[d]
Inpatient care[e]	$10,548	$-2,256 (0.03)
Physician care[f]	4,236	-480 (0.21)
Outpatient care, mainly facility dialysis[f]	19,668	-12,132 (0.00)
Other non-inpatient services, including home dialysis supplies	960	8,808 (0.00)
Total[g]	$ 35,412	$ -6,060
Percent of Total	100.0%	-17.1%

a. Medicare-defined costs are Medicare payments plus patient obligations.

b. From Held and Pauly.[9] Includes transplant patients. Data have been converted from monthly to an annual basis.

c. Calculated as (the natural log to the exponent of the estimated coefficient) minus 1 times the mean for that category.

d. Probability of a Type-1 error (rejecting a null hypothesis that was indeed true) with a two-tailed test.

e. Short-term general hospital.

f. Physician payments for supervision of dialysis under the "initial method" (also called fee-for-service) are included in outpatient payments.

g. The sum of the subcategories above.

observed differences in cost by accounting category are actually "savings." For convenience, however, we cease to put the word in quotation marks.) The biggest savings come in outpatient care, where a drop of over $12,000 per patient occurs in the main "outpatient" category; this decline is partly offset, however, by an almost $9,000 increase in "other" charges (primarily home supplies). Thus, from the point of view of dialysis only, the direct difference of home dialysis is about $-3,300. The inpatient average is also lower by over $2,000; physician by about $500. During this period, hemodialysis was the dominant home therapy. Since then, continuous ambulatory peritoneal dialysis (CAPD) has become more important. CAPD patients use more disposable appliances than do hemodialysis patients, so that supply costs may be higher for them, although we have no definite data on this.

Shown in Table 3 are what can be called the indirect cost increases (or "losses") of switching a patient to home dialysis, other covariates held equal. These results come from the same multiple linear regressions that produced Table 2's figures. For this analysis, the main covariate is the ratio of home patients to in-facility patients at the patient's supervising dialysis unit. The dollar effect per year is again shown in the last column. Whereas direct costs showed a savings, indirect costs show an increase totalling a positive $4,807 per year or 13.6 percent of the total. The largest increase comes in outpatient care, $3,115 per year, with $1,810 per year for inpatient care.

The results of Tables 2 and 3 are combined in Table 4 to derive the net result of the direct and indirect implications of home dialysis for Medicare costs. Overall, these results suggest a savings of $1,253 per year or 3.5 percent of total Medicare costs.

Table 3. Indirect "Losses" of Home Dialysis in Medicare-Defined Costs, 1977-1981[a]

Category	Mean Annual Cost, All ESRD Patients[b]	Indirect Cost Increase (+) Per Home-Patient Year, Other Covariates Equal[c] (p-Value)[d]
Inpatient care[e]	$10,548	$1,810 (0.00)
Physician care[f]	4,236	503 (0.01)
Outpatient care, mainly facility dialysis[f]	19,668	3,115 (0.00)
Other non-inpatient services, including home dialysis supplies	960	-620 (0.00)
Total[g]	$ 35,412	$ 4,807
Percent of Total	100.0%	13.6%

a. Medicare-defined costs are Medicare payments plus patient obligations.

b. From Held and Pauly.[9] Includes transplant patients.

c. Calculation differs from that of Table 2 since this effect is measured as a continuous variable of the proportion of a patient's units receiving home dialysis.

d. Probability of a Type-1 error (rejection of a null hypothesis that was indeed true) with a two-tailed test.

e. Short-term general hospital.

f. Physician charges for supervision of dialysis under the initial method are included in outpatient payments.

g. The sum of the subcategory means and indirect costs respectively.

Table 4. Net Savings of Home Dialysis on Medicare-Defined Costs, 1977-1981[a]

Medicare Cost	Effects ($) of Home Dialysis Per Patient Per Year		
	Direct Effects	Indirect Effects	Net Savings
Inpatient care	-2,256	1,810	-446
Physician care	-480	503	23
Outpatient care, mainly facility dialysis	-12,132	3,115	-9,017
Other non-inpatient services, including home dialysis supplies	8,808	-620	8,188
Total	-6,060	4,807	-1,253
Percent of Total	-17.1%	13.6%	-3.5%

a. See Tables 2 and 3 for details.

DISCUSSION

This paper uses multiple linear regressions to confirm that total Medicare costs directly attributable to home dialysis patients are roughly $5,000 to $6,000 lower than others per patient per year (about 17 percent lower), as was previously reported in comparisons of simple means. Those earlier comparisons examined only place of dialysis and did not adjust for any patient covariates (such as case mix, age of the patient, size of the unit, and so on). The similarily of these observed direct differences in costs suggests that obvious differences in the severity of illness, as measured by these patient covariates (age, complicating condition, etc.) do not have dramatic effects on the estimated direct cost effects of home dialysis. For example, these estimates with case mix adjustment show a direct difference of 17 percent whereas Eggers' estimates, without case mix adjustments, show a difference of 21 percent or 4 percentage points more. Those 4 points presumably reflect selection effects controlled for by the covariates used here.

More importantly, however, we find that other, previously unrecognized, indirect cost effects almost eliminate the apparent dollar savings of home dialysis. As a higher proportion of a dialysis unit's patients choose or are assigned to home dialysis, other Medicare costs increase that are not normally attributed to home care. Even though there is ultimately a net savings of about 3.5 percent from each move home, at least for the time period on which this paper focuses, it is dramatically smaller than is the direct effect. Policymakers have focused only on direct effects and so have overestimated home savings by an order of magnitude. In fact, indirect cost increases reduce actual savings to Medicare and all other payers from an estimated 17.1

percent to only 3.5 percent, barely one-fifth as much. The net result calculated here corresponds reasonably well with the earlier results of Held and Pauly, whose estimate was 1.4 percent.[9]

The results also suggest two likely explanations of the observed paradox that Medicare cost accounts show considerable savings for specific individual home patients but almost none in the aggregate for units with home patients. The first explanation is that Medicare cost accounting shows only direct effects and does not adequately show the offsetting indirect effects of home patients on costs normally attributable to in-unit patients. We cannot specify exactly what costs rise for in-unit patients when a unit serves more home patients. We assume that standby capacity, telephone backup services, recordkeeping, dietician, social work and general overhead are all involved. Such costs to the unit of a home patient were generally not billable to HCFA for home care at this time; thus, these in-unit costs inappropriately appear as costs for in-unit patients.

The second explanation is that patient selection factors may account for some of the apparently lower direct costs for home patients. That is, healthier, less costly patients may go home, leaving more costly ones in units. This analysis did control for some objective severity factors—demographics like race, sex, and age, as well as medical factors like number of years on dialysis, primary diagnosis, and complicating conditions. Controlling for such covariates has the expected effect; it reduces the direct cost difference for home patients from -21 percent to -17 percent per patient year, about one-fifth. This result is consistent with biased selection among home patients (whether through cream skimming by providers or self-selection by patients). But these objective indicators fail to capture less obvious differences among patients; any experienced physician or other dialysis provider knows that otherwise similar patients (in age, diagnosis, and the like) can differ markedly in need for medical attention, outlook on life—and suitability to home dialysis.

To what extent may unobserved selection factors explain lower home costs? The most suggestive evidence on this point comes from the inpatient costs experienced by home and other patients. Just as direct dialysis costs appear to drop for home patients (Table 2), so do inpatient costs. It is possible that inpatient costs are lower for home patients because at-home dialysis makes them healthier and less likely to need hospital services, although even advocates of home care have not emphasized this point as a benefit or source of savings. Alternatively, hospital costs may be lower because home patients were already healthier when they went home in ways not captured by the covariates used in this analysis.

The latter explanation seems more plausible, especially when one considers the indirect cost effects for inpatient care (Table 3). If home care directly cut hospital costs by making home patients healthier, there would be no indirect effect on remaining in-unit patients; they would simply cost the same regardless of how few or how many others in their unit were dialyzing at home. In fact, however, indirect inpatient costs are higher where home care rises, as shown in Table 3--by fully $1800 per patient year, almost completely offsetting the direct reduction. (The same general phenomenon occurs with regard to physician services.) It seems very likely that considerable risk selection occurs among home patients beyond the case mix factors adjusted for here. Some improvement in home patients' morbidity may also occur, as reflected in the net savings on inpatient care of $446 annually (about 4 percent of average inpatient costs).

That home dialysis patients are only marginally less costly for all payers than in-unit ones is the main quantifiable message of this paper. It confirms by analyzing individual patients Held and Pauly's prior estimates of very low savings from home dialysis. Held and Pauly's prior estimates were based on differences across dialysis providers: The current analysis strengthens those findings by explaining how indirect cost increases offset direct cost decreases, resulting in little savings whether one takes the perspective of an individual patient or of a unit.

These findings of low net savings from home dialysis are so different from conventional wisdom that some further discussion is warranted. It may make the result less surprising to work through in a conceptual way how home dialysis lowered and raised Medicare-defined costs in the pre-1983 era from which our cost data came. The big savings from a Medicare program or insurance viewpoint is that no payment is made for an aide or other labor involved in home dialysis, whereas in a unit, one nurse or technician typically serves 3 or 4 patients. Similarly, no indirect labor costs (from accounting to overhead) were chargeable to home care. Only easily identified incurred costs for labor, equipment and supplies were charged to home care. On the other hand, capital costs and maintenance are higher for one dialysis machine used for one home person in isolation than for in-unit machines, each of which can serve multiple patients and can readily be serviced on a regular basis along with many others. Similarly, supplies cost more in the home setting where bulk purchasing and delivery are not possible, where reusing dialyzers is less practical, where utilization controls are unenforceable, and where patients had little financial incentive to save, since no dollar limit applied and the patient could keep none of any savings (unlike the payment "screen" or ceiling applicable to most units). On balance, however, home care appears to save money based on dialysis-only categories of direct savings (outpatient plus other in Table 4)—about $3,300 on a base of about $20,000, in short, less than one might expect. This is the direct effect of home dialysis.

Seen from the point of view of the unit supervising home patients or of Medicare paying for all patients, however, the indirect effects must also be counted. As noted, two main indirect effects exist: Remaining in-unit patients cost more because of adverse selection (i.e., they are sicker), and overall unit costs rise because certain expenses of following home patients are not specifically chargeable to those patients but must be met from revenues earned on in-unit care. The net savings (direct less indirect) total only $829 per home patient year (see Table 4) for the main dialysis-related categories (outpatient plus other). Additional net savings occur for hospital care, but only to Medicare, not to units.

Finally, this explanation is bolstered by actual behavior of dialysis units and patients since the time period studied. In 1983, Medicare changed the method of payment for dialysis to a prospective "composite rate" that was independent of the location of services.[5] Almost all home patients' care is now paid for by paying the unit involved a flat fee. Each dialysis unit now receives the same payment for both home and facility treatments. Previously, Medicare had paid less for home dialysis, as already noted, typically not directly to the unit involved. If there were dramatic savings from home dialysis, this 1983 change in payment practice would certainly have created financial incentives for nephrologists and others in this industry to encourage more patients to dialyze at home. Indeed, the change in payment was intended to do so. And there are few if any observers of the dialysis industry who would suggest it does not respond to chances to make a dollar.

What has happened to the number of home patients under the new Medicare payment rules? After one year under the new payment scheme, the proportion of home patients has increased only from 19.0 to 19.4 percent.[20] The percentage of patients on home hemodialysis actually decreased in the interim; only the growth in relatively new Continuous Ambulatory Peritoneal Dialysis has maintained the home population. The failure of the change in payment methods to increase home patients suggests that home dialysis is not in fact a much less costly form of therapy from the viewpoint of the overall unit, just as Table 4 indicates. Of course, it is also possible that patients resisted switching sites, although such strong preferences have never been recognized during the long debate over home care.

Fiscal factors are not--or should not be--the only determinant of where a patient receives dialysis. Patient desires are very important, for instance, and Evans et al.[21] report that the selection of home dialysis patients they interviewed are happier with their life than are in-facility dialysis patients.

In our judgment, no one therapy is likely to be ideal for all dialysis patients. In a pluralistic society there should be a pluralistic set of therapies for ESRD patients. What therapy is used should be decided by patients, their families, and their physicians. The government's role is to decide how much to spend and what range and level of services to make available to patients. How that support is spent is best left to individual patients and their agents. In that regard, the new prospective payment policy that pays the same rate for all therapy locations is a good one. We trust that appropriate choices for home care are being made. But our results suggest that the new regime will yield neither major cost savings to Medicare nor major profit opportunities for providers emphasizing home dialysis.

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APPENDIX A

STATISTICAL APPENDIX

Functional Forms and the Derivation of the Impact of Home Dialysis on Costs

A. Functional Form

The four separate cost functions (outpatient, inpatient, physician, and other) have the general form of:

$$(1) \quad C/P_1 = A_o x_1^{a_1} (e^{a_2 x_2}) (P_2/P_1)^{a_3}$$

where
- C = a measure of cost (e.g., outpatient)
- P_1 = a measure of input prices in the locality of the dialysis unit
- P_2 = a second measure of input prices
- A_o is a constant term to be estimated
- x_1 = covariate(s) that enter into the function with an exponential coefficient
- x_2 = covariate(s) that enter into the function as an exponential; both the individual home patient binary and the proportion of a unit's patients that are on home dialysis have this form
- a's = coefficients to be estimated

The estimation of (1) is simplified by taking the natural log (LN) of both sides:

$$(2) \quad LN(C/P_1) = LNA_o + a_1 LNx_1 + a_2 x_2 + a_3 LN(P_2/P_1)$$

B. Derivation of Impact of Home Dialysis

1. Continuous Case; Proportion of Home Patients and their Indirect Cost Effects:

(3) $$\frac{d(C/P_1)}{d\ x_2} = A_o x_1^{a_1}(e^{a_2 x_2})(P_2/P_1)^{a_3} \cdot (a_2)$$

$$= a_2(C/P_1)$$

and

using Δ's to represent small changes, (3) becomes

(4) $$\Delta C = a_2 C\, \Delta x_2$$

In the case at hand,

(5) $$x_2 \equiv \text{(home dialysis patients/in-facility patients)}$$

Then (4) becomes:

(6) $$\Delta C = a_2 C \Delta\, \text{(home dialysis patients/in-facility patients)}$$

For the changes considered, the total patients are held constant and the change is for one patient changing from in-facility to home dialysis, or:

$$\Delta x_2 = \Delta\, \text{(home dialysis patients/in-facility patients)}$$

$$= 1 \quad /(\text{in-facility patients} - 1)$$

Therefore, (6) becomes:

$$(7) \qquad C = \frac{a_2C}{(\text{in-facility patients} - 1)} \cdot i$$

Equation (7) provides for the cost impact per patient of a change in the proportion of home patients. However, this impact applies to all patients associated with the dialysis unit and not just to the one patient switching to home dialysis. Therefore the total impact of the change in the proportion of home patients is:

$$(8) \qquad C^* = a_2C \frac{(\text{total patients})}{(\text{in-facility patients} - 1)}$$

where C^* is the cost across all patients in the dialysis unit.

To evaluate (8) for the estimates of indirect cost presented in Table 3, we used the mean total patients and mean in-facility patients for units with home patients. These estimated means were 67.36 and 51.93 respectively.[20] This produces an expression in the right of (8) of (67.36)/(51.93-1) or 1.32. This implies that (8) is evaluated as $1.32a_2C$.

As shown by Held and Alexander,[22] units with home patients are larger than units without home patients. If one desired to estimate the impact of a single home dialysis patient at the average of all dialysis units (in contrast to the calculation in Table 3 which used the average of units with home patients), the expression in the right of (8) would be (50.08/42.02-i) or 1.22. The evaluation of (8) would be $1.22a_2C$.

This alternative produces estimates of the indirect cost that are 92 percent (1.22/1.32) of the estimates shown in Table 3, i.e., 8 percent lower. This alternative leads to a higher net savings of home dialysis of 4.6 percent instead of the 3.5 percent shown in Table 3.

2. Discontinuous Covariate; The Direct Savings for the Individual Home Patient:

As shown by Halvorsen and Palmquist,[18] the correct calculation of the impact of a change in a discontinuous covariate such as the case of a home patient (coded 1) versus in-facility patient (coded 0) is given by:

$$(9) \quad \Delta C = C(e^{a_2} - 1).$$

For values of a_2 close to 0, the impact of a change is approximated by a_2. For example, for $a_2 = 0.050$, the value in the parentheses in (9) is 0.051. For $a_2 = 0.600$, the expression in parentheses (9) is 0.822.

C. Estimated Parameters

The estimated a's (proportion of home patients) for each of the four separate cost equstions were: outpatient cost 0.12; inpatient cost 0.13; physician cost 0.09; other cost minus 0.49. The corresponding p values for these parameter estimates can be found in Table 3.

Provider-Patient Relations and Treatment Choice in the Era of Fiscal Incentives: The Case of the End-stage Renal Disease Program

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TO WHAT EXTENT SHOULD PATIENTS MAKE decisions about their medical treatment, and to what extent should they defer to their doctors? What role do financial concerns play in decisions about site and type of treatment, and what role should they play? More specifically, is it a good idea to motivate patients with end-stage renal disease (ESRD) to choose their kidney dialysis units on the basis of price as well as medical quality, personal convenience, and other important factors?

There is enormous professional resistance to increasing patients' financial leverage (and risk), but this article concludes that appropriately structured patient financial incentives could serve patient interests, medical as well as fiscal. This conclusion rests upon the authors' own policy analysis, drawing upon relevant literature, a two-day working seminar to thrash out the issues with known opponents of patient financial incentives and others, and numerous field interviews with renal providers and patients.

Background: Patient Interests and Professional Choices

Concerns about physician-patient relationships and who's in charge in medicine are especially important today—in their own right, in

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light of increasing patient rights and demands for different approaches to medicine, and because of the increased financial incentives entering medicine.

Patient Choice and Professional Ethics

Traditionally, physicians have seen themselves as preeminent in medical decision making, with patients as trusting dependents. What are the sources of this world view? One is clearly physicians' specialized technical knowledge of disease, diagnosis, and treatment. The very essence of professionalism is that professionals have unique, untransferable knowledge and should naturally make treatment choices for patients (Parsons 1951; Freidson 1970; Starr 1982).

A second source of paternalism is physicians' own self-confidence, even bordering on arrogance. A certain authoritarianism seems necessary to cope with the exigencies of medical practice, especially in cases of life-threatening illness (Cassell 1985, 140–44) and to live with medical uncertainties (Katz 1984, 165–75). Third, patients themselves can be fearful, dependent, and childlike, demanding that authoritative physicians bear the burden of choice (Cassell 1985, 25–26, 45–46; Katz 1984, 125–26).

Traditional medical ethics, of course, seek to protect patients by constraining physicians to act in the best interest of their patients (American Medical Association 1980). Medical professionals thus have to consult their consciences about patient interests but generally need not directly consult patients, certainly not about most technical aspects of medical practice (MacIntyre 1977).

This conception of paternalistic doctors and passive patients traditionally fits even very well-informed and educated patients—such as, for example, the late Dr. Franz Ingelfinger, editor of the *New England Journal of Medicine*. Faced with glandular cancer, he was bombarded with contradictory advice that left him feeling "confused and emotionally distraught" and was much relieved to accept advice of a "wise physician friend" who said, "What you need is a doctor." That is, "a person who would dominate . . . who would in a paternalistic manner assume responsibility for care" (Ingelfinger 1980). At the extreme, professional paternalism extends even to the argument that it is ethical to lie to a patient if the physician thinks deception is indeed in the patient's best interests (as discussed in Brody 1982).

Although this paternal ethic seems to dominate medical thinking, many thinkers apply to medicine John Stuart Mill's classic assertion that a competent adult has the absolute right to be in charge of his own body and mind (Mill 1859; President's Commission for the Study of Ethical Problems in Medicine and Biomedical and Behavioral Research 1982b, appendix G [G. Dworkin. Autonomy and Informed Consent]). At its extreme, this view has been characterized as "patient sovereignty"—as contrasted with "medical paternalism" (President's Commission for the Study of Ethical Problems in Medicine and Biomedical and Behavioral Research 1982a, 36).

In today's ever more common legal contests, the doctrine of patients' "informed consent" to treatment governs these matters. On the surface the doctrine seems to assert patient control, but its majority version holds that professional standards govern the legal duty, thus maintaining professional control, and both courts and legislatures have moved to bolster the majority view (Rosoff 1981; President's Commission for the Study of Ethical Problems in Medicine and Biomedical and Behavioral Research 1982b, appendix L [The Law of Informed Consent]; Katz 1984). Even so, medical professionals tend to think the law interferes far too much with professional autonomy and doctor-patient trust (DeLee 1976; Laforet 1976).

One very closely reasoned book argues the reverse, that "patients' participation in decision making is an idea alien to the ethos of medicine" which the law of informed consent does little to change; more is needed to promote the unfamiliar value of physician-patient communication (Katz 1984). The President's Commission for the Study of Ethical Problems in Medicine and Biomedical and Behavioral Research (1982a) has also called for more shared physician-patient decision making. Others have suggested that a "therapeutic alliance" between doctor and patient best serves both parties and reduces the likelihood of litigation (Gutheit, Bursztajn, and Brodsky 1984).

From a medical-philosophical perspective, the question of "who's in charge here?" is thus ever-present in medical care, as in all professional-client relationships (Burt 1981). Moreover, from practical and legal perspectives, the issue has become even more salient because of growing demands for more patient rights and more patient-oriented medical practice (President's Commission for the Study of Ethical Problems in Medicine and Biomedical and Behavioral Research 1982a).

Enter Fiscal Stringency

Money has finally reared its ugly head in insured doctor-patient relations, adding new reason for worry about who makes most therapeutic decisions—and thus determines medical spending. Under the old open-access, insured fee-for-service system, predominant at least as an ideal type until recently, payers would cover nearly any service a physician thought medically necessary, at nearly any provider-set rate. This generous financial regime, a golden age for providers and patients, allowed enormous professional autonomy without creating financial conflicts between doctors and patients. The cost for this freedom from conflict was, of course, rapidly escalating health care bills.

Since the mid-1970s for Medicaid (Bovbjerg and Holahan 1982) and the early 1980s for Medicare and the rest of the world (Califano 1986; Willis 1984), government, insurance, and business payers have begun insisting that either providers or patients take charge in a financial sense as well as a medical one. This profound shift in social expectations has been labelled a "buyer's revolution" against the comfortable old regime (Califano 1986).

It may also be revolutionary for provider-patient relations. Payment reforms are either provider or patient oriented. Provider incentives generally involve prepayment for certain coverage, whether for a year's care, as in health maintenance organizations (HMOs) or for a hospital stay, as under Medicare's diagnosis-related groups (DRGs). Physicians may also receive financial penalties and rewards based on fiscal performance. This approach to reform deems providers far more important decision makers than patients; some proponents explicitly hold that patients cannot be expected to be held fiscally responsible at the time of care (Enthoven 1980).

The patient-oriented approach to reform is exemplified by greatly increased patient cost sharing, both under public plans (Feder et al. 1982) and private ones (Califano 1986). Newer ideas include rebates of unspent health insurance money (Califano 1986) and rewards to patients who use less expensive providers under preferred provider organizations (PPOs) (Boland 1985).

Either type of reform can introduce unpleasant financial pressures into physician-patient relationships, and raise questions of how well patient interests are served. Reformist rhetoric assumes that cost-effective choices will be made in patients' best interests once payment mechanisms are correctly ordered, both because of competitive pressures and because of legal and professional-ethical constraints (Bovbjerg, Held, and Pauly 1982; Enthoven 1980). Congress was sufficiently concerned about physician incentives under DRGs or HMOs to ban payments to doctors that could motivate underservice (U.S. Congress 1986). (U.S. reforms are often part of a "procompetitive" framework, but financial constraints under wholly noncompetitive systems can pose similar issues for provider-patient relations, as, for example, the United Kingdom's fixed public budgets put providers firmly in charge of medical-fiscal choices [Halper 1985].)

ESRD as a Test Case

To evaluate the new incentives, one must go beyond theory and look at actual cases. Which cost-conscious approaches, in fact, best serve patients' interests? How do patient and provider incentives actually interact in the determination of treatment regimes? This article examines these issues in the very instructive context of ESRD payment reform.

ESRD offers a good place to examine the changing fiscal-medical state of the world because Medicare cost containment came first to ESRD. Unlike most of Medicare, ESRD coverage *began* with provider-oriented fiscal incentives. Medicare paid nephrologists largely by fixed capitation rather than provider-set fees for service, and independent dialysis units also essentially received fixed prepayment. Initially, the units' charges were limited by a national "screen" or maximum payment level; more recently, the so-called "composite rate" has applied an even lower fixed-payment level for all maintenance dialysis units in an area (U.S. Department of Health, Education, and Welfare 1973; Rettig 1982; U.S. Health Care Financing Administration 1983).

Moreover, ESRD patients comprise a "worst case" test of patient-choice issues because conventional wisdom holds that they are among the least autonomous of patients. ESRD patients are very sick, goes this view, and chronically dependent on medical technology for mere survival—which promotes exceptionally strong psychological dependence on doctors and passive patient behavior (Halper 1985, 67). Notably, ESRD patients have *financial* reasons for dependence as well. Most of them can no longer work and rely on public assistance for income as well as medical coverage. Medicare's cost-sharing obligations (typically, 20 percent coinsurance) are often met by provider charity when not covered by Medicaid or private insurance, and nephrologists are required to take assignment. Because patients seldom pay providers themselves, they can seldom feel financially in charge of their own care and are not so perceived by providers.

Enter Patient Incentives

In 1983 a new idea burst forth on the kidney scene: to give ESRD patients financial incentives, but in a new way, through positive rewards rather than negative penalties. The U.S. Health Care Financing Administration (HCFA) (1984) proposed to give patients rebates for choosing less expensive dialysis units for their care. This proposal led to the so-called "competitive bidding" demonstration, which was tried in Denver and Riverside, California, for a brief period in 1985 (Held and Bovbjerg 1985).

The basic idea was that HCFA would ask kidney dialysis units to "bid," that is, to say at what price they would provide dialysis. Where units bid a price below the prevailing composite rate, their patients would receive most of the difference in cash. Patients in nonbidding units, however, would not be penalized. For patients, the plan was all carrot and no stick. Physician payment rules were not to be changed in any way, but obviously one unit's physicians could lose fees if a patient chose to dialyze in another unit where they did not practice. All existing quality rules were maintained, and potential changes in quality were to be monitored.

An example may help clarify the model. Suppose Medicare's composite rate was $130 per dialysis in a given area. One or more providers might bid a price of $120 because they were already particularly efficient, could run a larger-scale unit, or could motivate patients to do more self-care or dispense with certain amenities. Bidders could then reward their patients with 70 percent of the $10 difference for each dialysis (or about $1,000 per year) and expect in turn to be rewarded by attracting more new patients.

No providers were to be excluded as a result of this so-called bidding; in contrast, under more normal bidding, losers lose completely—only the winner(s) can participate at all (Bovbjerg, Held, and Pauly 1987). The HCFA proposal was in this way quite conservative;

all patients were protected from having to change by the ability to stay exactly where they were, without penalty (unlike PPOs, for example). The expectation was that new patients entering dialysis and existing home patients would be the ones most interested in bidding units, since such patients would not have to shift from an established location as would patients already dialyzing in a unit. Patients could use the rebates for any purpose; many expected drugs and transportation (uncovered by Medicare) to be leading candidates.

The model was termed "competitive bidding," and bids were necessary to create price differences among which patients could choose, but the key was patient choice. Only the reward of attracting more patients gave providers any incentive to bid at all. The name "patient-choice model" would have been more appropriate—in truth the plan closely resembled a per dialysis voucher—but the name "competitive bidding" stuck.

Assessing HCFA's Model

Two of the authors were asked by HCFA to evaluate its model after plans for the demonstration were announced (Held and Bovbjerg 1985). We had previously cautioned against using conventional bidding for ESRD services (Bovbjerg, Held, and Pauly 1982, 152) and had no pride of authorship in HCFA's proposal (it was added to our pending grant application by special condition [Pembleton 1983].). But we had been more sympathetic to patient vouchers (Bovbjerg, Held, and Pauly 1982, 152–56), and in giving HCFA technical advice about demonstrating the model, we had come to appreciate its potential value for patients.

We nonetheless approached evaluation with some caution partly because the model differs so greatly from conventional, provider-oriented practice in ESRD, although not from patients' exposure to prices elsewhere. For the ESRD program, the patient incentive indeed proved radical. Its announcement was met with an unanticipated firestorm of resistance, particularly from Denver nephrologists. In light of this vehemence, we wanted to reconsider whether the HCFA proposal so threatened patients that we should not be involved at all—as some suggested. Assuming that it did not, we wanted to hear what potential pros and cons of the model we should investigate further. We decided to hold a conference—a working seminar—to discuss patient choice and financial incentives, mainly in the demonstration model but also in the larger context of fiscal constraints generally.

Given this background, we were most concerned to hear from known opponents, but all of the affected interests were represented in our two-day discussions—including a dialysis social worker, an experienced head dialysis nurse, an activist patient, an economist who has studied the kidney program, a lawyer who has written about informed consent, and several well-known nephrologists. The full spectrum of nephrology practice was in attendance, practicing and academic, with and without any financial interest in any dialysis unit.

This article grows out of our preparations for these sessions in November 1984 and the points of view argued at this working seminar, often with some heat. It also draws on extensive subsequent interviewing of physicians, patients, and others in Denver and Riverside (Bovbjerg, Held, and Newmann 1986), as well as many less formal interactions. The balance of this article follows our seminar's division into three key sections: (1) patients' capacity for making choices, (2) the influence of provider fiscal interests, and (3) the influence of patient fiscal interests.

To What Extent Should and Can Patients Make Choices?

No one seems to object to the principle that "every human being of adult years and sound mind should have a right to determine what should be done with his own body" as expounded by Justice Cardozo,[1] echoing John Stuart Mill. But when discussion turns from abstract principle to the practical question of whether patients *can* make appropriate choices, the issues immediately become more complex, and qualifications or rationalizations begin to emerge about patients' (in)capacities.

The first facet of the question is whether patients are mentally or psychologically equipped to make choices among an inherently complex set of options of providers and of type and place of treatment. There seems substantial agreement that ESRD patients at first diagnosis are least likely to be in an adequate frame of mind to make good choices.

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[1] *Schloendorff v. The Society of the New York Hospital*, 211 N.Y. 125, 105 N.E. 92 (1914).

Here, our conference participants agreed with conventional wisdom about patient confusion and passivity (Halper 1985, 67; Bovbjerg, Held, and Pauly 1982, 139), particularly when the diagnosis is made suddenly, in the context of a medical emergency, with no previous warning that kidney failure was a possibility. As for other life-threatening diseases, a diagnosis of ESRD can easily stimulate overwhelming anxiety, with its concomitants of denial and confusion. A complicating, if short-lived problem for ESRD patients is that after kidneys fail and before the patient's condition is stabilized through dialysis, elevated levels of blood toxins can physiologically reduce the ability to think clearly for a week or so. Given the ready availability of almost fully financed treatment, it seems particularly easy for ESRD patients simply to go with the first conveniently located provider(s) to whom they are referred.

Roughly half of ESRD patients have no advance warning of impending kidney failure and hence face these difficulties in their most acute form. According to our seminar participants and interviewees, stabilized patients in maintenance dialysis are much more capable of independent choice, but typically have already committed to one set of ESRD providers, notably a nephrologist and a dialysis unit, and have started one mode of treatment, typically in-unit hemodialysis. Other choices remain, notably of changing site or mode of treatment (for example, to home care or continuous ambulatory peritoneal dialysis), and, of course, patients can in theory always change providers, although in practice few patients do under the current system.

Participants differed in whether they thought many patients' choice of dialysis location might be changed by small per dialysis incentive payments and in how well informed they expected such choices to be. The physicians generally saw the typical ESRD patient as incapable of understanding all the issues involved in care and likely to suffer from "information overload" when showered with information. Physicians generally felt that information and choice often tended to paralyze rather than facilitate decision making.

Nonphysicians with direct ESRD experience—either as patient or as nonphysician health care professional—felt that at least some patients can be helped to participate in most decisions regarding their care. The timing and manner in which needed information is imparted was held to be critical, however, as well as its content. Patients whose renal failure is progressive rather than sudden can and should be educated before final failure, held this line of thinking; all discussion should feature a neutral site and atmosphere, nondirective presentation, considerable repetition, and some written descriptions for reference.

No one disputed that the full range of treatment choice is very complex. Most of the physicians consequently felt strongly that only nephrologists can be counted on to understand the implications of treatment and the particular patient's medical condition. Nonphysicians felt equally strongly that the patient's physician should not decide alone. Any nephrologist is expert in a particular type of treatment and, therefore, tends to overemphasize its advantages relative to other methods. It was noted, for example, that a nephrologist's specialty interest correlates with the type of treatment his patients receive (on this point see Friedman and Lundin 1984).

This implication of physician bias stimulated the rejoinder that all sources are biased and that physicians are at least experts who, having put any bias on the table, remain the most competent source. Others responded that, however expert, the person who stood to gain from delivering certain forms of care could be expected to have a particularly strong reason for bias and possibly also for concealing it—making an independent source of advice especially valuable. This led to the suggestion that the government might usefully create an information bank addressing different therapeutic alternatives; patient associations could play a similar role.

How Do Provider Financial Incentives Affect Patient Choice?

One of the main financial incentives of ESRD physicians is the flat Medicare payment per patient they receive for supervising maintenance dialysis. Most nephrologists, however, also have a financial interest in one or more dialysis units where they practice, whether in for-profit or not-for-profit units. Some have an ownership interest, some have profit-sharing arrangements, and some receive benefits tied to the number of patients contributed. Moreover, doctors clearly can earn fees only from patients of units where they practice. How do physicians respond to these financial inducements?

All participants agreed that physicians definitely care about how many patients they and their units have, not only because of the income generated but also because the size of a nephrologist's practice influences professional standing. Physicians frankly admitted that the influence of financial incentives to acquire and retain patients was a disturbing issue for them. Conference participants—physicians and nonphysicians alike—nonetheless felt that the majority of physicians do "the best job of taking care of patients" that they possibly can, regardless of financial incentives. Some physicians could not be relied on to put patient interest before financial reward, however, and mention was even made of some nephrologists' thinking of patients as "property" that generated income for them. How many? Some physicians thought the proportion of self-serving nephrologists was very small (less than 5 percent), others that it might be substantial (30 or 40 percent). Most of the nonphysicians agreed with the higher estimate.

All participants could also cite instances of physicians putting inappropriate pressure on patients. Some described what they considered immoral "patient stealing"; for example, a doctor leaving one unit might falsely imply to patients that they would have to follow the physician in order to continue their accustomed treatment regimen. Others characterized such behavior more legalistically, as a violation of the physician's contract with a particular unit (not with patients). Less extreme pressure was also mentioned, that doctors and other professionals often give subtle but hostile psychological signals to patients who express any desire for change.

Compared with other specialties, nephrologists perceive greater need to hold on to their patients, it was argued. Other specialists tend to get a relatively constant flow of referrals; moreover, because of the nature of episodic disease, one patient constitutes a far smaller share of their practice than does a chronic, ESRD patient for a nephrologist, and there are not a lot of extra patients to go around. (A national survey of dialysis units in 1984–1985 indicated that fully 83 percent of their medical directors wanted to attract more patients and could comfortably handle an average of 50 percent more [Urban Institute 1985].) Also, it was asserted that most specialists do not normally lose a patient because of the latter's preference for a particular mode of therapy. With ESRD, however, a patient who chooses a kidney transplant is a significant and permanent loss not readily replaced. (So is a patient's move to a different unit, perhaps one more committed to home care, for example.) Most nephrologists' financial security is thus more tied to a single therapeutic modality than is that of other doctors. One participant even voiced the opinion that current financial incentives actually impede the progress of nephrology research, by leading physicians to become wedded to dialysis rather than pursuing the search for better forms of treatment.

The financial incentives involved in unit ownership or profit-sharing provisions came in for more self-criticism among the physicians than those involved in the per patient capitation payment. At least one physician said that he avoided such interests as a personal decision because of the potential conflict of interest between serving the patient's interest and the firm's. Others countered that physician-owned facilities ensure that the person in charge knows the business. For-profit units' fiscal incentives are also clear and overt, unlike the arrangements at many not-for-profit facilities that also reward nephrologists for their contributions to patient census. Everyone agreed that disclosure lessened the potential for conflict or abuse of discretion.

How Do Patient Financial Incentives Affect Patient Choice?

The effects of patient financial incentives stimulated the most intense debate both in our seminar and in almost all other discussions or interviews. The main concerns were that the doctor-patient relationship could be disrupted to the patients' detriment, that patients could make bad choices (to accept lower quality dialysis care in order to receive cash payments), and that it is inherently immoral for a government health care program to make cash payments to patients. These concerns were mainly but not exclusively raised by physicians.

Harm to Patient Trust

A good doctor-patient relationship, including mutual trust, is universally perceived as extremely important to good treatment. Most agree that the requisite thorough knowledge of the individual patient's medical history, family circumstances, overall health, physical condition, and psychological vulnerabilities is best obtained through a continuing physician-patient relationship, particularly for long-term, chronic patients. Physicians exposed to the bidding-patient choice model almost universally object that the payment incentive interferes with good relations and trust, a conclusion typically presented as self-evident. To change providers obviously severs any existing relationship, and a decision to change providers may cause a psychological rift with current providers before a move is made. Some seminar participants felt that such choices could stimulate bad feelings and a tendency to disruption that might lead to an occasional accident and conceivably even some deaths. Of course, new patients' initial choice of their first unit interferes with no existing relationship.

A contrary viewpoint notes the previously made points that the typical patient is extremely dependent and that in some cases doctors or others inappropriately pressure patients who consider alternative treatment modes or dialysis units. Such dependence and pressure seem incompatible with mutuality and trust. Might not a financial incentive such as the rebate-like payment proposed by HCFA actually help a patient to make a more informed decision about his or her own well-being, rather than continue in a dependent or pressured relationship? So went the rhetorical question. The issue did not seem resolvable in the abstract; whether choosing one relationship over another is harmful mainly depends on how good the two are.

Bad Choices

Again here, physicians and some others expressed doubts about whether a patient can be informed enough about the merits of various units, their staff physicians, and treatment patterns to make a responsible decision. The main concern, however, was that the chance to get money would cloud patients' judgment, causing them to move away from high-quality providers (units and physicians). Interestingly, such arguments assume that high cost alone adequately shows quality, although participants were actually in substantial agreement that the correlation between cost and quality for maintenance dialysis is not necessarily high.

In light of the typical patient inertia and the pressures against change, financial incentives were seen as most likely to influence three subsets of patients—already independent patients, dissatisfied patients, and many of the poor. The first group includes those patients who naturally place a high premium on finding out about alternatives and on making an informed choice, i.e., very autonomous people who feel at least potentially confident of their ability to maximize their own well-being. The second group includes those who are already unhappy or not doing well medically under their current regimen, and who at least arguably could expect to benefit from a change. The third group (mostly poor persons) includes those who are less concerned about their existing provider relationship (including the continuity of their care and potentially its quality as well) than in the alternatives that ready cash could bring (including payment for drugs or transportation). For the first two of these groups, there was little disagreement with the proposition that such patients stood to benefit, or at least not be harmed, by a change in their doctor or dialysis unit.

With respect to the third group—patients felt to be most interested in ready cash—the argument about bad choices was made with more force. Some participants saw any choice as one between cash and the best treatment; they seemed to feel that to choose money over care was frivolous. But others, mainly the nonphysicians, felt equally strongly that patients could have good reasons to prefer money to the very best treatment in medical terms—even assuming that lower price necessarily implies lower quality, which it does not. Moreover, it was at least arguable, some asserted, that any short-run detrimental consequences of promoting patient choice might be outweighed by the longer-term benefits to patients from being encouraged to weigh their own treatment options and to participate more in decisions affecting them.

Only relatively modest cash payments seemed likely to emerge from the proposed bidding, so they would have strong appeal only for poor patients. It can be troubling to influence the poor more than others, but they are also the persons most susceptible to legitimately competing demands of their households for other material needs. Forgoing color TV and a box lunch during dialysis to save for food for the baby at home was given as an overdrawn example of the point. It was clearly difficult for the clinically oriented participants to think about legitimate nontreatment-spending alternatives—although most (not all) acknowledged the point in principle.

One more practical objection deserves mention, that per dialysis cash payments might inappropriately motivate some patients to dialyze more frequently than was medically desirable. (This could be accomplished, it was pointed out, by being careless with diet and medication, causing symptoms that would require more frequent dialysis.) The general sense of the meeting seemed to be, however, that the time and transportation costs and the generally unpleasant nature of dialysis for the patient would render this a minor problem at most. It was also pointed out that paying a monthly incentive rather than per dialysis could eliminate the overtreatment incentive altogether.

Illicit Lucre

Most opponents of the model much preferred to focus on the normative argument that it is inherently immoral for government medical programs to make cash payments to patients. This contention took two forms. The first was the familiar paternalistic argument that, since one cannot trust public beneficiaries to spend cash wisely, any benefits should be in-kind benefits. Many supported the idea of giving not cash but vouchers for ESRD-related medications, of which the typical patient needs several hundred dollars worth a year. Others proposed that any cash payments be earmarked to pay Medicare's Part B deductible. It was pointed out, however, that the deductible is rarely paid out of pocket, so that using the incentive payment toward the deductible would be equivalent to making an extra payment to the unit (i.e., a provider incentive, contrary to the demonstration's patient-centered design).

In connection with the cash versus in-kind argument, participants were asked to consider why this bidding's payment incentive was so different from that of the earlier HCFA demonstration of paid aides for ESRD patients dialyzing at home. Those patients were given money to pay a relative or other support person to help them dialyze at home, whereas Medicare normally provides no such assistance. (The idea was to promote home care, thought to be medically and fiscally superior.) Although some participants agreed that the two models were similar, others rejected the comparison because payments for home aides were tied to actual medical spending (even if the work was done by a family member), whereas the cash payment could be used for anything. The fact that home patients under the bidding-patient choice demonstration *could* choose to use their payments to help cover a home aide was not perceived by these participants as making any real difference, nor was the fact that families in which a spouse was paid also ended up with more disposable family income.

The second form of the normative argument, emphasized by a few physicians at the seminar and in interviews, saw the proposed cash payments as an illegitimate bribe to patients for going to a particular unit, as well as an inappropriate payment simply for being sick—a kind of undeserved windfall profit (on bribery, see also Freeman 1984). It is different from allowing private patients to save on cost sharing or giving them a rebate because in the latter case the money involved is the patients' own. That is, it is legitimate to return a proportion of money that patients themselves had already paid but not to reward someone financially who had no assets at financial risk in the first place.

This argument came in for lively rebuttal from both physicians and nonphysicians. The first point made in rebuttal was that patients may not have financial assets at risk, but they certainly have their comfort, health, and ultimately their life on the line—all likely to make them think carefully about their choices. This point was considered true but irrelevant by opponents. The second rebuttal was that standard economic theory holds that people react essentially in the same way to positive as to negative payment incentives as long as the money involved is small relative to overall wealth. (That is, a small, certain cash reward like this incentive has the same impact as a cut in cost sharing.) Noneconomist participants remained skeptical. (As an anonymous reviewer noted, some social psychology suggests that where risks of loss and rewards are *uncertain*, unlike the known incentive here, people may feel worse about losing money once possessed than "losing" only a promised incentive never obtained [Tversky and Kahnemann 1981].)

The third rebuttal was made as a hypothetical question: Is the proposed patient-choice payment morally different from other proposals to offer general Medicare beneficiaries vouchers that would allow them to buy the insurance coverage of their choice and use the difference, if any, for any purpose they like? This analogy seemed to be the most telling counterargument. It caused substantial pause, although the opponents of cash payments remained adamant, citing quality grounds.

A final argument against cash payment was not made by any participant or interviewee: In-kind medical programs are politically more popular than cash assistance programs ("welfare"), and allowing patients even to seem to reduce "medical" spending in exchange for money may compromise political support (Havighurst and Blumstein 1975).

Hostility to HCFA

One important nonsubstantive reaction to HCFA's proposed demonstration was not foreseen by the seminar agenda: Throughout the discussion there ran a strong undercurrent of hostility and cynicism on the part of the physician participants. At first, anger and frustration were specifically directed at the proposed demonstration, but later came to include HCFA and cost containment more generally. (Subsequent interviewees were also often hostile, typically less so the further removed from the actual demonstration.)

HCFA was accused of interfering with health care with no regard for the quality of care. It was seen as uninterested in patient choice, really, but only in budget cutting. In so doing HCFA was ignoring its statutory responsibility to solicit the advice of the relevant experts on health care, namely physicians. HCFA had convened a group of nephrologists to brief them about the impending demonstration and to get their reactions, but was thought not really to take their concerns seriously. Although the overwhelming physician reaction expressed at that meeting was negative, HCFA went ahead without even significant modification of its plans. Of course, nephrologists as a group, many dialysis unit owners, and some patients had been adamantly opposed to the 1983 price reductions of the "composite rate" (U.S. Health Care Financing Administration 1983), predicting dire consequences; they even sued, unsuccessfully, to block the cuts. Although the full effects of changes brought by this rate reduction are not yet documented, obvious disasters have not occurred. This line of thinking did not change the vehemence with wich opponents felt that *further* changes would indeed pose grave problems.

When asked whether cutting payments to some unit(s) in a bidding process was any worse than a gradual ratcheting down of the composite rate for all units, most seminar physicians felt that there was essentially no difference. Those who saw a difference felt that bidding was worse, as did many interviewees in the demonstration sites. Their reasoning was not always clear, but a central element seemed to be that it is destructive to stimulate patients even to consider a move, and to make units compete for them directly on the basis of price. Gradual whittling down of everyone's price seemed greatly less threatening.

Most participants and subsequent interviewees assumed, interestingly, that regular maintenance dialysis in freestanding facilities could indeed be adequately performed for less than the going rate, clearly one fear was that the bidding demonstration would reveal just that and would prompt HCFA to cut payment rates nationwide. We were not privy to HCFA's motives in developing this model, but we can note that the patient-incentive model as proposed—unlike most bidding—was not well calculated to induce the lowest feasible bid or to be generalizable nationwide. Subsequently, HCFA did indeed cut dialysis rates nationally, but used accounting findings—not bidding—as the justification (U.S. Health Care Financing Administration 1986). The cuts were retroactively "rolled back" to nominal levels by Congress (U.S. Congress 1986).

Another perceived danger was that higher-cost units that serve the hard-to-treat patient and emergencies—typically units attached to hospitals—would "go under" as a longer-term result of continued price squeezes. This, in turn, would mean leaving such patients with nowhere to go. This point was pressed in spite of frank acknowledgment that not only high-risk patients but also accounting rules and other factors make hospital-based facilities more costly. Those concerned about the hospitals' fate were unimpressed by a reminder that payment "exceptions" are available for high-cost units to receive a higher rate both under the current system and under the demonstration.

Somewhat paradoxically, given objections to the extent of HCFA interference in ESRD, the bidding demonstration was also criticized as too narrow—that it was arbitrary in the extreme for HCFA to make "guinea pigs" out of the nephrologists, patients, and dialysis units in two particular sites. Some trial run was deemed better than immediate large-scale implementation, but this was seen as very cold comfort for Denver and Riverside.

Concluding Thoughts

Three interrelated central themes emerge from considerable reading, thinking, and discussions about giving ESRD patients positive financial incentives. First, quality of care is the main reason for public concern, and physicians are its natural advocates. Second, the overt focus on price and competition is the main reason for physician concern, only in part because of potential effects on quality. Third, the key determinant of anyone's reaction to HCFA's model is whether they trust patient choices, particularly when money is involved.

Quality

Paying less often means getting less, certainly in normal competitive markets. But not always. Economies of scale can yield savings, as can enhanced competition among providers or greater self-help by patients—all possible outcomes of HCFA's voucher-like incentive model for kidney dialysis. Almost all physicians, either at our conference or otherwise, however, have found it almost impossible to accept that a low bidder could actually provide equal or better care. For them, a lower bid necessarily meant either worse care or "cream skimming" of inexpensive patients, leaving sicker, high-cost patients to nonbidders. They also assumed that at least some patients would act against medical advice (their physician's) in choosing a unit. (That bid units might accept lower profit margins with the same level of quality also did not seem to be a plausible alternative.)

Moreover, accepting the hypothesis that costs and quality go hand in hand, very similar dangers surround *all* economizing incentives, not just HCFA's demonstration proposal for outpatient dialysis. For example, one may object that hospitals that are paid fixed amounts per DRG—or dialysis units paid the composite rate—may make inappropriate cutbacks in care to save themselves money. It is not obvious that patient welfare will suffer more when providers must economize so as to attract patients, as in the demonstration, than when prepaid providers economize for their own reasons. The golden-age option of having no one economize no longer exists.

Finally, there are reasons to believe that increased competition would tend to *improve* quality—certainly as perceived by patients. And patients may have somewhat different goals from their providers. Many dialysis markets have been relatively uncompetitive in the sense that a few providers have a large market share and entry of new dialysis units has been barred by regulation (Bovbjerg, Held, and Pauly 1982, 143–48). Moreover, patients have no financial stake that encourages them to seek the best value. Traditionally, medical competition has focused on quality (Bovbjerg 1981, 980–83; Joscow 1983), and in the special case of dialysis, there is empirical evidence that greater competition means lower returns for providers and hence higher value given to patients (Held and Pauly 1983; Joscow 1983). The availability of a financial reward could prompt patients to be more demanding whether they move or not, forcing more provider attention.

Money

There are certainly grounds for concern that over-economizing will hurt patients, whether medical-fiscal choices are mainly made by patients, physicians, or, for that matter, bureaucrats. Why are ESRD providers so hostile to enhanced patient choice as an adjunct to provider-oriented economizing? This article has covered several altruistic explanations, mainly that HCFA cuts and bad patient choices will in fact hurt patients and quality of care. Opponents were quite sincerely passionate about these points.

Much less altruistic motives, however, also exist, most notably financial self-interest. Strikingly, the numerous nephrologists and other physicians we talked to were quite comfortable with "traditional" ESRD payment practice—putting providers in charge of economizing—at least at historical payment levels. It comes as no surprise that providers oppose administrative price cuts on the ground that patients will suffer. It is more surprising that they oppose allowing volunteer economizers (the bidders) to give almost all of the savings to patients rather than to HCFA. We cannot directly assess physicians' or dialysis unit operators' motives any more than HCFA's. Yet, it is hard to escape the conclusion that providers fear price competition, under which nonbidding units and their nephrologists might lose some patients and might have to improve service to the rest. In contrast, noncompetitive price cuts to all could more readily be met, at least in part, by ratcheting down services or amenities to nonmobile patients.

Patient Capacity for Choice

The arguments about patients' (in)capacity to make therapeutic choices have been thoroughly discussed elsewhere (President's Commission for the Study of Ethical Problems in Medicine and Biomedical and Behavioral Research 1982a), although with little attention to the relevance of financial incentives. We conclude here that ESRD patients would probably benefit by participating more in choices about their care, including the choice of where to receive treatment.

ESRD patients are now theoretically entitled under Medicare rules (U.S. Health Care Financing Administration 1985) and the law of informed consent (Katz 1984) to participate in treatment choices, but the law does not work well as a matter of substantive rights (Katz 1984) or practical enforcement (President's Commission for the Study of Ethical Problems in Medicine and Biomedical and Behavioral Research 1983, appendix 2 [R.E. Rosenblatt. Rationing "Normal" Health Care]). Ultimately, to achieve more participation, patients must be assertive about wanting more participation. HCFA's patient-incentive model offered new financial leverage for patients to command providers' attention in this regard. And it did so in a way that protected patients: patients could only gain financially, existing quality protections were maintained, enhanced competition was meant to help quality, and patients were free to stay with nonbidding units at the old payment rate.

To us, these structured choices about where to dialyze seem within patients' capacity to make. Even more consequential decisions are, at least in theory, left to patients (with professional advice, of course), including the ultimate decision to terminate treatment altogether (Neu and Kjellstrand 1986) or the major changes of seeking a transplant—both of which have financial as well as medical and personal consequences. Being put more in charge financially (without threat of financial loss) could well boost patient autonomy, with potential personal and medical benefits, much as being more in charge medically through self-care at home is often said to do (on patients' fiscal involvement, see generally Bovbjerg and Held 1986). Properly understood, the incentive could make patients feel that program payments were for *them*, not for their nephrologists or dialysis units. Even patients choosing a nonbidding unit could well benefit psychologically from making a choice—and they might find their providers more attentive to their wishes as a result.

Moreover, more patient control might well promote "quality" more broadly than the technical medical quality beloved of physicians (or the morbidity/mortality outcomes beloved of researchers and policy analysts). After all, ESRD patients are not so totally dependent and despondent as some might believe; their sense of well being and satisfaction is not dissimilar to that of others, and they express certain clear interests (Evans et al. 1985). Thus, giving patients a larger say might indeed shift some dialysis resources away from physicians' preferred uses toward what patients want. Not all patients have to be shoppers or assertive of their rights to make providers responsive. Even a small proportion of assertive patients can be economically important to providers where patients can move; and providers' responses generally have to apply to all patients, both shoppers and nonshoppers.

Of course, if patients participated more actively—and financially—in decisions on their treatment, including its location, some "mistakes" would surely occur, certainly from the perspective of nephrologists. But from this perspective, mistakes already occur without financial incentives. Almost all nephrologists candidly admit in private that they know of one or more dialysis units in their region to which they would refuse to send a dependent or spouse for care.

It remains an open question how many ESRD patients truly want the increased control that would likely come with exercising greater financial power. The rather atypical patient at our conference clearly came to believe that enhanced patient responsibility was desirable. So have others in private conversations and in interviews. The attitudes of patients in general remain unclear, even after the actual demonstration was tried (see postscript below). Many patients might reject financial inducements for all the reasons already discussed; this is a reason for not forcing patients but for accepting the results of each patient's choice in consultation with his physician in a fair test of alternatives. It is very different, however, to object that patients should not have the opportunity to choose, as have most opponents of even demonstrating this new patient incentive.

Quite independent of new patient financial incentives, we strongly suspect that any policy initiative that promotes greater patient autonomy and choice constitutes a threat to traditional professional prerogatives and will be resisted by the medical profession, certainly in ESRD. The history of disputes over informed consent lends support to this suspicion. Even without economic pressure, all professionals seem to resist increases in clients' assertiveness. Nephrologists are quick to emphasize the importance of patients having trust in physicians; few seem willing to trust in patients.

Postscript

After this seminar was held and despite provider resistance, in 1985 HCFA pressed ahead with its demonstration of a somewhat altered bidding-patient choice model. (The largest change, made elsewhere from the original model, was to make Supplemental Security Income (SSI) recipients ineligible for rebates.) Much to the surprise of the ESRD community and especially of Denver nephrologists, one dialysis unit there made a bid for care beginning in April 1985—and for a strikingly low amount, creating a rebate of over $8 per treatment for eligible patients. No bid was made in Riverside, and apparently no new patients came to the bidding Denver unit as a result of the rebate. As was the bidder's right, the bid was withdrawn after six months, and HCFA has evidently decided not to continue this or other bidding demonstrations in ESRD.

Our assessment showed that the model had not really received a fair trial (Bovbjerg, Held, and Newmann 1986). Riverside had been an inappropriate site for patient choice because its huge geographic area and the wide distances between its dialysis units precluded any significant patient movement. In Denver, patients had virtually no understanding of their options. Problems included the final model's making many patients ineligible to receive a rebate and the failure of both HCFA and the bidding unit adequately to explain patients' options to them. The biggest reason for lack of patient movement, however, seemed to be active resistance within the nephrology community. The bidding unit lacked even the wholehearted support of its own staff nephrologists. No one played the key role of entrepreneur in promoting a very unfamiliar and oft-vilified innovation. So patients' attitudes remain unclear.

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